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**Editor-in-Chief Comments**

Happy New Year and new decade to all athletic trainers and members of our Association. Well, the 1990s are here and the field of athletic training is certainly going to be challenging and exciting. I look forward to the new advances in sports medicine that are on the horizon, as I'm sure you do.

**Index**

If you need the complete (1956-1989) Cumulative Author/Subject Index, it is available on diskette which may be purchased for $10.00. Make check payable to ATHLETIC TRAINING, JNATA and send request to Dr. Ken Knight (address at left). Please specify 3 1/2 inch or 5 1/4 inch format.

**Abstractors Needed**

If you would be interested in helping out with the abstracts published in the Journal, please contact John Wells.

**Closing**

Here's wishing you and your teams a healthy spring season.

**Letters to the Editor**

The staff of Athletes in Action U.S.A. Sports Teams is already making plans for over twenty-five 1990 summer overseas projects. As I'm sure you are well aware, athletic trainers who are interested in summer opportunities must act early in order to secure a position.

I am writing because I need your help in recruiting athletic trainers for each of our overseas teams. With almost 500 athletes, coaches and other sports personnel traveling to six continents around the world, it is very important that we have good medical coverage. Obviously, we would like to have each of our teams covered by an NATA Certified Athletic Trainer. However, I feel that our summer teams are also an excellent opportunity for mature student trainers and graduate assistants to gain the experience they need to further their careers.

This summer marks AiA's ninth consecutive year to send out summer teams. The purpose of AiA is to promote international development of sports and to use that platform to share the Christian faith. If you would like to recommend someone or are interested in traveling yourself, please contact me.

Sincerely,

Paul Newman, ATC, MS
Athletic Trainer/Associate Staff-AiA
Assistant Trainer, Murray State University

707½ Main Street
Murray, KY 42071

Telephone: (502) 762-6804
Upon review of the “Letter to the Editor” from Kelly Mead, ATC, in the Winter issue of the Journal (Vol. 24, No. 4), I would like to commend Ms. Mead for her stance on our National Convention exhibits. I agree with her comments that we must present a more professional image, both amongst ourselves and in public view.

There is no place in a professional meeting for an exhibitor to blatant lever use a scantily clad female to “attract business.” Unfortunately, too many of our colleagues still confuse our professional meeting with a vacation. Thus, our exhibitors prey on our naivete and lack of professionalism for the quick sale of their wares.

The letter has sparked the interest of several athletic trainers in the Houston area, and I feel it is wholeheartedly supported by the athletic trainers in our area that are devoted to professional advancement of our profession. Regrettably, we still have a few “good ol’ boys” that confuse professionalism with sexism.

Ms. Mead, you should be commended. Continue your efforts to upgrade our Association and our National Meetings; I applaud them. I hope that our paths may cross some day. I would like to shake your hand. Hopefully, our membership will stand up as a profession and demand that we “clean-up” our act on this issue.

Bill Wissen, ATC, LAT
Hastings H.S. Sports Medicine Dept.
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In recent years, exercise scientists have taken that simple concept a step further. Their findings show that athletes can reduce the effects of fatigue, and improve athletic performance, by choosing foods and fluids wisely.

We recognize your interest in learning more about ways in which nutrition affects performance. So please join us for Nutrition and Performance, a one-hour workshop to be held at your NATA district meeting this year. We look forward to seeing you.

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THE QUAKER® OATS COMPANY
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Expanding Our Body of Knowledge

Kenneth L. Knight

Many of you have commented that you agree with my efforts to move this journal towards publishing all research articles. That is not, nor has it ever been, my intention. It would be a disservice to the NATA to make this a “research journal”. Now I do not retract any of my statements in previous editorials, nor apologize for publishing any of the articles concerning the need for research in athletic training. We must have more research. But publishing research is only part of the mission of this journal.

One of the most important tasks of the NATA is to delineate, develop, and expand the athletic training body of knowledge; or stated another way, to increase our understanding of the skills and techniques used by the everyday athletic trainer in the trenches to care for athletes and their injuries. Many units of the NATA have expended great amounts of time and expense in this endeavor, and will continue to do so. The Role Delineation Study and Educational Competencies developed by the Certification and Professional Education Committees define the bounds of our body of knowledge. Although these documents were developed to give athletic training students a road map for gaining knowledge and skills, they also direct what we publish in Athletic Training JNATA.

Increasing numbers of athletic trainers are writing text books. This is healthy. I hope this trend continues; that more of the text books written for athletic trainers are written by athletic trainers. Athletic Training JNATA must be dedicated to expanding the body of knowledge that’s unique to athletic training. One way to do so is to publish pertinent research. We must continue to upgrade the quality and quantity of the research articles that we publish. Research is essential to our profession—we’ll die without it. But so are good technique articles.

Scholarly technique articles are just as important to expanding our body of knowledge as research articles are. Most athletic trainers have ways of preventing injuries, caring for, or rehabilitating them, that are not generally known to the membership at large. Professionals in other fields have skills and knowledge, which if adapted to the perspective of athletic trainers, would be beneficial to our membership. Our body of knowledge is expanded as we identify these unique ideas and techniques and get them into print in a manner suitable for our entire membership to read and use.

What is a good scholarly technique article? My dictionaries define scholarship with the words “accurate” and “well disciplined learning”. Such articles are not a rehash of material found in the standard athletic training textbooks, but rather articles that expand the breadth and depth of material in the standard textbooks; articles that compare and contrast various approaches to sports injury management; articles that synthesize new knowledge from other disciplines in a meaningful way so that athletic trainers can understand and use it; articles that analyze and describe old (but unpublished) or new techniques and skills used by the everyday athletic trainer.

A scholarly technique article must describe the technique in enough detail that others who have never seen or heard of the technique could perform the technique. They also must include appropriate discussion of how and why the technique differs from similar more well known approaches. Both the methods presentation and the discussion should outline the “why” as well as the “how”. Abundant rationale for various aspects of the technique should be included. They will usually include analysis and synthesis of exhaustive searches of the literature. And they never are written with big long words and scientific jargon that few can understand.

Is writing articles for publication easy? Not at all. It requires an initial draft and many revisions, often after other people have read and critiqued it. And even after many drafts, you sometimes get cold feet and wonder if what you have to say will be of any benefit to others. I threw away my first article three times before finally sending it in because I was scared of being made a fool. I didn't want to stick my neck out, because I was sure it would be cut off. One of the reasons we adopted the double blind review process was to minimize authors’ fears of embarrassment.

Two other helps for prospective authors are a revised Guide to Contributors (Dec 1989) and a list of writing tips and hints (included elsewhere in this issue). The writing tips are a compilation of the most common suggestions given to authors during the past four years. We hope these will give those of you who have much to say, but aren’t sure how to say it, enough assistance to get your ideas onto paper.

Many athletic trainers feel they don't have the time to write. It does seem that many of us live by the principle of “selective neglect”—that there is never enough time to do all that we want and feel we must do. Few of us can find enough time in a day or week to sit down and write and rewrite an article. But we all can find time to jot down a few ideas or outline an article. Then perhaps next month you can find another hour or two to work on it. What does it matter if it takes two or three years to complete the task? (I started this editorial two years ago, and have worked on it at least 15 occasions since.) The race doesn’t always go the swift. Athletic trainers must lead out in the acquisition of new athletic training knowledge. We must control our destiny. We must define the body of knowledge that is athletic training. And as we do so our athletes will receive better injury care and we will increasingly become the authorities that others look to for “expert opinion” concerning all phases of sports injury management.
President’s Message

Dear Members,

By the time you receive your Journal the Board of Directors will have made many important decisions affecting the Association and its members. First and most important is the hiring of our first full time Executive Director. By January of 1990 there were nearly 200 applicants for this position. Lawrence Leiter and Company of Kansas City, Missouri, with the assistance of the Board of Directors, will have screened and interviewed candidates by the Mid-year meeting in Dallas, Texas. Your new Executive Director will be presented to the membership at the National Business meeting in Indianapolis this coming June.

The National Convention committee met in Indianapolis in January to finalize plans for the June convention. I would like to extend a special thanks to Ross Baily at TCU. Ross negotiated and signed a three year contract with American Airlines and Delta Airlines to provide reduced rates to our meetings for Association members. This contract will provide 40% off the full day coach fare or 5% off of the lowest promotional fare for which the passenger may qualify. More information will be sent in your convention packet.

I would like to thank those who supported me in the last Presidential election. To me this is an expression of the confidence you have in your Board of Directors who have worked very hard to allow the NATA to grow in a positive way as we enter the 1990's.

I'll look forward to seeing you in Indianapolis.

Sincerely,

Mark J. Smaha, ATC
ABSTRACT: This manuscript presents information and exposes inaccuracies about smokeless tobacco in a question and answer format. Knowledge gained from research is described. Prevention and cessation strategies are discussed, relative to involving health care professionals and athletic trainers in curtailing the use of smokeless tobacco among athletes in particular and youth in general.

The 1986 Surgeon General’s Report on smokeless tobacco estimated the number of smokeless tobacco users at 12 million (32). The report further estimated that, in 1985, 6 million people used smokeless tobacco at least weekly. One source placed the figure closer to 22 million (17). A nationwide household survey by the National Institute on Drug Abuse indicated that 16 percent of males between 12 and 25 years of age used some form of smokeless tobacco in 1985 (24). Several county, state, and regional surveys estimated the use of smokeless tobacco among youth to be as high as 39 percent (1,11,13,14,20,25). Whatever the number of users, it is apparent that smokeless tobacco is popular among young people, particularly adolescent and young adult white males.

Moreover, among the various groups, athletes use it more than the general population (12). Consequently, athletic trainers should have a thorough understanding of smokeless tobacco products, terminology, and methods and patterns of use, if they wish to be credible when discussing this form of tobacco with athletes. While the harmful effects of smoking are known among health professionals, a similar level of knowledge about smokeless tobacco may not yet be present. We (the authors) are all actively involved in smokeless tobacco research and have selected the most common questions asked by other health professionals, athletes, the general public, and youth.

What is smokeless tobacco?
This type of tobacco is not ignited. Combustion occurs with cigarettes, pipes, and cigars. Smokeless tobacco is either chewed, sucked, or inhaled into the nostrils (32).

Are there different types of smokeless tobacco?
Just as smoking tobacco consists of pipe, cigar, and cigarette tobacco, smokeless tobacco consists of snuff and chewing tobacco. Snuff is cured, finely ground tobacco which is available in three forms: dry snuff has the consistency and color of cocoa; moist snuff is of a longer cut and typically sold in a round tin or plastic can weighing 1.2 ounces (34 grams); sachet is moist tobacco in a tea bag-like pouch also sold in a round tin or plastic can. Chewing tobacco also is available in three forms: loose-leaf tobacco is shredded tobacco leaves dipped in a flavoring such as molasses and sold in a 3-ounce pouch; plug tobacco is compressed tobacco marketed in the form of a small brick (2" by 3" by ¼" in depth); twist tobacco is tobacco leaves twisted to look like a piece of long licorice, rope or braid (12).

Since there are so many types, are the products used differently?
All forms of snuff (moist, dry, sachet) are “dipped.” Dry snuff can also be “sniffed” through the nostrils, a practice common in Great Britain, but not in the United States. All forms of chewing tobacco (loose-leaf, plug, twist) are “chewed” (2).

What do “dip” and “chew” mean?
When a user “dips,” he takes a pinch (moist or dry snuff) or sachet and places it in the gingival groove between the cheek or lip and gum. The tobacco absorbs saliva and the user employs the anterior portion of the tongue to poke or press the tobacco against the lower lip. This squirts tobacco juice out of the tobacco, into the mouth.

When a smokeless tobacco user “chews,” the cheek is stuffed with a “chaw” or “quid” of loose-leaf, plug, or twist tobacco resulting in the characteristic bulge in the cheek. Seldom does the user actually chew chewing tobacco. Instead, he sucks on the tobacco and occasionally bites down gently to release both juice and flavor. The releasing of the juice creates the need to expectorate or swallow (12).

Is smokeless tobacco a male dominated habit?
The majority of the users are male. Only about 1-2 percent of the female population uses smokeless tobacco.
Why the sudden popularity of smokeless tobacco?
We think that as cigarette smoking became increasingly unpopular due to its health consequences, tobacco companies began promoting smokeless tobacco in the late 1960’s and early 1970’s. They utilized sports figures, entertainers and masculine role models to promote smokeless tobacco (7).

What caused the increase in smokeless tobacco?
The increased popularity can be linked to advertising campaigns by tobacco companies which removed the unsavory image of the habit. The smokeless tobacco user was promoted as manly or macho. Some tobacco advertisements suggest smokeless was safer by saying, “take a pinch instead of a puff.” Youth were exposed to entertainment and sports idols using and selling these products. They seemed to believe that if their idols used it, it had to be safe (10). Due to pressure from various health organizations and researchers, the smokeless tobacco industry in 1986 voluntarily withdrew well-known sports personalities from smokeless tobacco advertisements. However, they have continued to use unknown sports figures.

Are more people using smokeless tobacco products today?
Smokeless tobacco use has been popular since Christopher Columbus and his crew were introduced to tobacco in October 1492 by the American Indians. Tobacco use grew rapidly throughout Europe and by the early 1800’s Americans preferred to use plug tobacco or snuff rather than smoke tobacco. By the early 1900’s many people turned away from smokeless tobacco for two reasons: the availability of cigarettes from the newly developed cigarette-rolling machines, and the campaigning of public health groups to combat the spread of tuberculosis due to the spitting chewing tobacco.

Smoking continued to gain popularity whereas smokeless tobacco use remained relatively unpopular until the early 1970’s. In the following 15 years (1970-85) there was a rise in smokeless tobacco sales. Sales have recently taken a "dip" (23). Smokeless tobacco sales were down in 1986 and 1987. The decrease has come because of labeling regulations and taxation, as well as the bad press on the detrimental health effects (23).

Why do young people start using smokeless tobacco?
It is seen a masculine thing to do; because parents, friends, coaches, sports figures, and teammates use it; to try to express independence; to try to act “cool” or mature; because athletes use it; while others think it is a safe alternative to cigarettes (20).

Is smokeless tobacco a safe alternative to cigarettes?
No. Check the warning labels on smokeless tobacco products. The Surgeon General has recently required three rotating labels in the same manner as cigarettes (32). Smokeless tobacco users are not exposed to respiratory lung diseases, as are cigarette smokers, because no combustion takes place and no gases are generated.

What constitutes a user?
Three groups of users have been identified: 1) light, 2) moderate, and 3) heavy. A light user consumes ½ or less of a can or pouch per week. A moderate user consumes ½ to 2½ cans or pouches per week and a heavy user consumes anything greater than 2½ cans or pouches per week (26). These are all approximations because more important than the amount consumed is the nicotine content. For example, a person may use two cans per week and consume less nicotine than one
What are the effects of smokeless tobacco?

The most common effects are bad breath, stained teeth, tooth sensitivity to heat and cold, cavities, gum recession, and burning and irritation of the gums. Other problems may include tooth and bone loss, leukoplakia, addiction, and oral cancer (15,28,32).

What is the white patch in a user's mouth where the tobacco is held?

Obvious wrinkling or a white leathery patch, which develops where the tobacco is held, has been defined as leukoplakia. Three to six percent of leukoplakia lesions have the potential to convert to cancer (32).

What are the cancer causing agents in smokeless tobacco?

The prime carcinogenic ingredients in smokeless tobacco are a class of tobacco-specific nitrosamines, derived from nicotine and other tobacco alkaloids (15,32). Hoffmann and colleagues reported that the four most common tobacco-specific nitrosamine compounds found in snuff have concentration levels ranging from 2,000 to 80,000 parts per billion (ppb) (18).

The Federal Food and Drug Administration (FDA) and the U.S. Department of Agriculture (USDA) have set tolerance limits regarding the exposure of humans to nitrosamines. The dimethylnitrosamine level found in cured meats is 5 parts per billion (ppb) (29,30). Levels of nitrosamines found in snuff are thousands of times (up to 16,000 times) higher than the FDA and U.S. Department of Agriculture would allow in cured meats such as bacon.

How could the FDA and USDA allow this to happen?

Tobacco is not regulated by the FDA or the USDA. Tobacco is controlled and regulated by the Bureau of Alcohol, Tobacco and Firearms.

What is happening when the gums pull away from my teeth where the tobacco is held?

The constant contact of the tobacco on the gums forces them to recede, exposing the root of the tooth. Once the gums recede, the user has an increased risk of cavities and bone and tooth loss. Smokeless tobacco users have a 9 times greater risk of developing gum recession than nonusers (15,28,32).

Is smokeless tobacco addicting?

The Surgeon General has stated that nicotine is an addictive as heroin or cocaine. Moreover, scientists have concluded that nicotine, the principal pharmacologic agent in all forms of tobacco, is a powerful, addicting drug (16,33).

The central element among all forms of drug addiction is that: 1) The user is largely controlled by a psychoactive substance (i.e., a substance that produces transient alterations in mood by effects in the brain) (15,33). 2) The drug must be "reinforcing"—that is, the pharmacologic activity of the drug is sufficiently rewarding to maintain self administration. 3) Another aspect of drug addiction is "tolerance" whereby increasing doses are required to achieve a specified intensity of response. 4) Finally, physical dependence on a drug can also occur, and is characterized by a withdrawal syndrome that usually accompanies drug abstinence. Moreover, after cessation of drug use, there is a strong tendency to relapse. Nicotine meets all these requirements (16,33).

Is it difficult to quit?

No successful methods have yet been developed to help users quit (3). Glover conducted two pilot smokeless tobacco cessation clinics adapting the American Cancer Society's "Freshstart" smoking cessation program for a total of 41 subjects (21 in the first session and 20 in the second). The success rate at six months was only 2.3 percent (9).

He noted that the complaints associated with abstinence from smokeless tobacco were typical withdrawal symptoms experienced by smokers but of greater intensity. The three favorite times to use smokeless tobacco were after a meal, with alcohol, and during stressful situations, which is similar to cigarette smokers.

Only one of the participants in the study was able to go for more than four hours without using smokeless tobacco. This individual did quit for more than six months and used nicotine gum as an adjunct to the cessation program (9).

If a user were to quit using smokeless tobacco, would any damage that had already occurred repair itself?

Yes, if no other mouth disorders such as gum recession and cavities exist. These problems (gum recession and cavities) require immediate medical treatment.

What is the relationship between smokeless tobacco use and heart disease?

Nicotine is a stimulant and alkaloid poison which is found only in tobacco products. The nicotine in smokeless tobacco causes the heart rate to increase and the blood vessels to constrict, leading to high blood pressure (32).

Some persons become sick and nauseous if they accidentally swallow tobacco juices. What causes this?

It is estimated that approximately 30 percent of users deliberately swallow (31). High levels of nicotine (alkaloid poison) are found in smokeless tobacco and is the primary reason people become addicted. Smokeless tobacco mixes with saliva and forms a brown juice which has a high concentration of nicotine. When this saliva is accidentally or intentionally swallowed, nicotine, being a poison, causes vomiting and dizziness.

Well, if a user does not swallow the juices, how does he get nicotine in his system?

When a user places a pinch or a chew in his mouth, nicotine is absorbed through the buccal mucosa (32). The nicotine is absorbed through the buccal region, because the smokeless tobacco has been buffered (high alkaline pH).

When users place smokeless tobacco in the mouth, it takes 3-5 minutes for nicotine to affect the central nervous system (CNS) (32). In contrast, when one smokes a cigarette, the nicotine affects the CNS within 6-7 seconds. It should be noted that due to the high acidity of flue-cured (smoking) tobacco, the absorption of nicotine through the buccal mucosa is virtually nonexistent. The CNS response is virtually identical whether the tobacco is smoked (lungs), dipped (buccal mucosa), or chewed (buccal mucosa).

Since nicotine takes longer to reach the central nervous system when using smokeless tobacco, that seems like an advantage to use smokeless tobacco over cigarettes; is it?

No. Nicotine is nicotine, no matter how it is absorbed. The typical cigarette has approximately 1 milligram of nicotine, while the average pinch of snuff (e.g., Copenhagen) has approximately 35 milligrams of nicotine. That means that the average pinch of Copenhagen contains 35 times more nicotine than the average cigarette!
What educational materials are available?

New resources, many at no charge, provide educators with up-to-date and accurate information for lesson planning and health counseling. Educational materials including pamphlets, posters, films, videotapes, slide/tape programs, models and teaching guides are available from care groups such as the American Cancer Society, American Dental Association, American Lung Association, National Cancer Institute, National Institutes of Health and the U.S. Public Health Service. None of these materials, however, has been evaluated clinically (3). An article by Laflin et al. is the most recent reference list of all the latest smokeless tobacco resources (19).

What can be done to curtail the use of smokeless tobacco?

School officials (coaches, physical education teachers, health educators, athletic trainers and others) must take positive steps toward educating students—particularly the younger students and athletes—about the negative health consequences of smokeless tobacco use (12). Education on the dangers of smokeless tobacco should begin as early as ages 6 and 7 (14). In developing education, prevention, and cessation efforts, the personality of the smokeless tobacco user should be taken into consideration (5,6).

State Health Departments should actively use public health laws to regulate smokeless tobacco products and restrict their promotion. Many schools are unaware that smokeless tobacco use by minors is restricted in most states. Because of the high usage among adolescent males (particularly athletes), enforcing this restriction might make the habit less socially acceptable, thus resulting in decreased use. Furthermore, all states should ban the free distribution of smokeless tobacco and tax it equal to cigarettes. State excise taxes could be used to finance education efforts.

Physicians and dentists can dispel the notion that smokeless tobacco is harmless or that it is a safe alternative to smoking. Moreover, parents need to know these facts so they can help their children make informed decisions and resist the influence of advertisements implying that smokeless tobacco is acceptable on or off the athletic field. Family members play an important role in condoning or supporting the use of smokeless tobacco, particularly in rural communities where smokeless tobacco use is apparently initiated at younger ages and often with family support (16).

Athletic trainers hold an important piece of the puzzle in curtailing the use of smokeless tobacco among athletes. When given the opportunity, athletic trainers should educate and encourage users to stop using smokeless tobacco. Trainers should not only stress the health consequences of use, but also should remind athletes of the important role models they are in society today (8).

Finally, the American Cancer Society has appropriated funds for the development of a cessation program for smokeless tobacco users. Much time, energy, and effort has been absorbed by the project. It has been field tested and will be available in the spring of 1990 (4).

REFERENCES

ANSWERS TO PREVIOUS CEU CREDIT QUIZ
“Evaluation and Correction of Common Postural Dysfunctions in the Athlete”

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

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<th>Questions</th>
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<tr>
<td>1. The level of knowledge about smokeless tobacco is probably about equal to that for smoking tobacco.</td>
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<td>2. Chewing tobacco is usually used by</td>
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<td>1. sucking on it.</td>
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<td>2. biting down on it.</td>
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<td>3. actively chewing it.</td>
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<td>4. sometimes swallowing small amounts of the juice.</td>
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<td>3. Tobaccos may help attract the female market because</td>
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<td>a. it comes in attractive flavors.</td>
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<td>b. it is nicotine free</td>
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<td>c. it is not necessary to spit during use.</td>
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<td>d. advertising strategies do not link it to masculine traits such as virility.</td>
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<td>4. Snuff is sold in smaller packages and contains less nicotine than chewing tobaccos.</td>
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<td>5. The youth market prefers</td>
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<td>c. moist snuff</td>
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<td>6. Young people appear to use smokeless tobacco because</td>
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<td>b. they believe it is safer than smoking tobacco.</td>
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<td>c. they feel it gives them an air of maturity.</td>
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<td>d. all of the above.</td>
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<td>7. Smokeless tobaccos are safer than smoked tobaccos because users are not exposed to respiratory lung diseases.</td>
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<td>a. True</td>
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<td>8. The percentage of leukoplakia lesions that have the potential to convert to cancer are:</td>
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<td>b. 8% or less</td>
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<td>c. 10% or less</td>
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Questions

9. One reason that the number of nitrosamines are extremely high in smokeless tobaccos is that
   a. the FDA is too busy with other issues to monitor and enforce lower levels,
   b. how much human intake of nitrosamines has not been determined,
   c. the USDA does not consider it an agricultural product,
   d. control and regulation is through the Bureau of Alcohol, Tobacco, and Firearms.

10. Nicotine meets all the requirements for being addictive because it
   a. is sufficiently rewarding to maintain self-administration by the user.
   b. leads to withdrawal symptoms if use is stopped.
   c. produces responses in the brain which cause transient changes in mood.
   d. leads to increased tolerance levels and increased dosages to maintain response intensity by users.

11. All smoked and smokeless tobaccos have adverse effects on the cardiovascular system.
   a. True
   b. False

12. The typical cigarette has 1 milligram of nicotine, whereas an average pinch of snuff has
   a. 25 milligrams.
   b. 35 milligrams.
   c. 45 milligrams.
   d. 55 milligrams.

13. Which of the following statements are true about smokeless tobaccos?
   a. Some users may be as young as 10 or 12 years old.
   c. As a habit, it is easier to quit than cigarette smoking.
   d. Most states restrict use by minors.
   e. Studies have delineated the effects by type of smokeless tobacco and age of user.

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Pathokinesiology of Supine Double Leg Lifts as an Abdominal Strengthening and Suggested Alternative Exercises

Marcia A. Silvermetz, MEd

ABSTRACT: This discussion is an overview of the jeopardy to the iliopsoas muscle at its thoracic and lumbar spine insertions and the subsequent problems of low back pain. The supine double leg lift, an action employed by many coaches and exercise instructors in conditioning programs, does not effectively strengthen the abdominal muscles. This exercise essentially activates the hip flexor muscles and statically (isometrically) contracts the abdominal muscles. The abdominal muscles do not cross the hip joint and therefore are not isokinetically involved. This review concludes that the hook-knee, curl-up exercise with a trunk twist and the feet unsupported is the most effective and safe abdominal exercise, because it is safe and non-inclusive of the hip flexor muscles.

This paper questions the strengthening effectiveness of the supine double leg lift on kinesiological, anatomical and biomechanical grounds. This movement has been employed for years in sports and conditioning programs as an abdominal strengthening exercise because the double leg raise requires static contraction of the abdominal muscles (5,12,18). The lift, however, is done against strong resistance due to the weight of the legs, precipitating pathokinesiological sequelae. Many patients with low back pain who present to our outpatient Pain Management Center previously have endured prescribed exercise programs which include the double leg lift. Our experience has been that this exercise causes more pain than therapeutic gain. The following discussion addresses these pathological considerations and suggests more appropriate abdominal strengthening exercises.

KINESIOLOGICAL CONSIDERATIONS OF THE SUPINE DOUBLE LEG LIFT

Unlike many supportive structures, the vertebral column of the human body is characterized by flexibility and limited rigidity. Therefore, the spinal column is frequently subjected to a complex system of forces and stresses. Of particular interest are the lumbar vertebrae and their adjoining muscles. Specifically, the iliopsoas muscle group (the psoas minor, psoas major, and iliacus) serve primarily as a hip flexor (1,15) (Figure 1) and can provide a powerful intrinsic force (some 1360 pounds) (13) on the lumbar spine. It approximately doubles the maximum flexion of the back and is a major contributor to back strength (15). In fact the psoas muscle above can exert almost 970 pounds of compression force at the L5-S1 disc (21).

As the psoas muscle contracts, it is joined by the iliacus to flex and tilt the pelvis forward. This is known as anterior pelvic tilt. The psoas compensates for any imbalance between the anterior abdominal muscles and the posterior paraspinal muscles in an attempt to stabilize the lumbar spine, as this part must be stabilized if full power is to be derived from the distal muscles in the extremities (15). Under certain circumstances however, the psoas muscle becomes a hyperextensor of the lumbar spine, this being referred to as the Psoas Paradox (18). This condition occasionally occurs in the supine double leg lift in which there tends to be a pull on the lumbar vertebrae by the psoas in an anterior and inferior direction (Figure 2).

Since adequate contraction of the abdominal muscles prevents psoas muscle hyperextension and influences the load of the lumbar spine (4,10,11), well developed abdominal muscles play a significant role in avoiding spinal strain and damage (21) and are of protective value. Nevertheless, since none of the four abdominal muscles cross the hip joint, these muscles cannot assist directly in the leg raising movement. In fact, EMG tracings have found little, if any, abdominal muscle action in this exercise (1,9,12,15,17). Rather, the abdominal muscles are involved only directly as an accessory muscle aimed at stabilizing the pelvis in the leg raise exercise (2). Most people, however, do not have the abdominal strength necessary to properly stabilize the pelvis against the pull of the stronger hip flexors (10). Consequently, the back hyperextends, the abdominal muscles are stretched and the back muscles become more vulnerable to strain (18).

ANATOMICAL CONSIDERATIONS OF THE SUPINE DOUBLE LEG LIFT

Spondylolysis is a stress fracture of the pars interarticularis and may produce back pain. This defect may or may not lead to spondylolisthesis, which is the actual displacement or subluxation of the vertebra in a forward direction on the vertebra below it (11,16). Spondylolisthesis leads to a prevention of the normal gliding movement of the facet joint. Premature disc degeneration, vertebral instability, and foraminal and neural root encroachment are all associated with spondylolisthesis (7). Such a predisposed condition may remain undiscovered if not for a blow or sudden twist that creates an abnormal stress upon the affected vertebra. The maintenance of the supine double leg lift position contracts the psoas, which increases hyperextension, increases vertebral stress, and thereby increases the risk for displacement of the vertebra at its origin.

The origin itself is weaker than the insertion because the insertion is a “double tendon” (the iliacus and the psoas on the lesser trochanter of the femur). The tendon of origin can

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Figure 1. The Psoas and the Iliacus work together to produce hip flexion.

NOTE THE INCREASED LORDOSIS WHILE PERFORMING THE SUPINE LEG LIFT
Adopted from Kendall, F., Muscle Testing S Function, 3rd edition

Figure 2. The Supine Double Leg Lift. Note the hypertension of the lumbar spine, thereby increasing the lordotic curve. Also note the lack of the abdominal muscles crossing the hip joint. They therefore do not help in the movement of raising the legs. (Permission granted from Kendall, F., Muscle Testing and Function, 3rd edition, Williams and Wilkins, 1983-granted 5/15/86.)

The subsequent overstretch and overuse is likely to lead to further muscular strain. In addition, sprains of the sacroiliac joint are a serious consideration when the supine double leg lift is employed. Ligamentous sprains, especially of the supraspinous, anterior longitudinal and posterior longitudinal ligaments are most frequently seen (3). Muscular spasm, due to the excessive tension, postural strain secondary to the hyperextension of the iliopsoas, and the quick, jerky movement of the leg lift exercise appear to

strain, causing lumbosacral pain or even possibly avulsion of portions of the transverse processes themselves. Spondylolisthesis in an advanced or chronic state can lead to disc rupture at the level of the slip, pedicular kinking of the nerve root, and strain of the supraspinous ligament (3).

Many of our patients present with strain/sprain of low back muscles. Continuing exercises like the double leg lift, which repeatedly tenses the iliopsoas, may diminish its elasticity and resting length and cause muscular tension (3).
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on a segmented and more fragile structure, the spine, and is therefore more liable for stress injuries than is the insertional area on the solid femur. The force is distributed along and up the entire muscle (Figure 3). Logically then, the spine is where the injuries and pain will occur, not in the stronger, double tendinous insertions on the femur (unless there is a possibility of osteoarthritis of the hip joint or other hip related disease processes).

Coaches and exercise instructors often prescribe the double leg lift to strengthen abdominals. In view of these anatomical, kinesiological and biomechanical considerations, the supine leg lift does not do what it purports to do, which is to increase abdominal strength, optimally or safely. The exercise appears to cause more problems than it ameliorates. The following abdominal exercises, however, have been examined and are suggested as appropriate alternatives for the acquisition of abdominal muscle strength.

ALTERNATIVE TRUNK EXERCISES

The trunk curl. From a long-lying or hook-lying (knees bent) position, the upper levels of the spine carry the trunk one third of the way toward the sitting position. As the head is lifted at the beginning of the curl, the upper portions of the rectus abdominis act (along with the sternocleidomastoids), followed by the oblique muscles. The scapula should be lifted from the mat, as this provides maximum (90%) activity of the external obliques and rectus abdominus. The position is held at 30-45 degrees from the mat. The trunk curl is valuable because it activates the abdominals without requiring significant hip flexion (8,18,19,23). The hook-lying position is used mainly because it neutralizes a possible hyperlordosis effect of the psoas contraction (3); however, the position does not elongate shortened hip flexors, a problem observed in many people (10). Therefore, any exercise program should include hip flexor stretches to maintain proper hip flexor muscle length. The force can be increased by moving the arms higher on the body or holding on to weights. It is not safe to “fling” the arms overhead since this hyperextends the low back (18, 21).

Whether completing a trunk curl in the long-lying or hook position, the activity of the hip flexors increases if the feet are held down; the pelvis moves onto the femur and the anterior superior iliac crest moves anteriorly, thereby increasing the lordotic curve. The full sit-up action (0 degrees to 90 degrees) is not superior to the trunk curl (0 degrees to 45 degrees) from the standpoint of abdominal development since the full sit-up also emphasizes iliopsoas contraction (5,10,18,19). Halpern and Bleck (8) state that in a full sit-up the spine is forced into maximal flexion and such a position can cause an increase in intradiscal pressure at L3. In contrast, the curl up to 30 degrees to 45 degrees is sufficient to increase abdominal strength without increasing the intradiscal pressure, thus it is recommended as a more effective and safer abdominal exercise (8,10,21).

The exercise that requires continuous abdominal activity is the curl-up with a trunk twist (3,5) (Figure 4). Furthermore, there is greater activity from the upper rectus and external oblique when the feet are unsupported than when supported. Both sections of the rectus abdominus are involved as the external oblique.

The reverse trunk curl. As the knees and hips are flexed, the knees are drawn toward the chest. In contrast to the former technique, this curl commences at the lower spinal levels. All abdominals are active (23). The obliques are more active and the hip flexors do not encounter great resistance. A twist, dropping the legs to the side, can be added for further muscular activity. Sarno (20) suggests a lateral sit-up, which also strengthens the oblique muscles as follows: Bend both knees and lift them toward the left

Figure 5. Sarno’s lateral sit-up.

Figure 6. The “V” sit-up. An advanced abdominal exercise.

precipitate these sequelea. Trigger points, hyperirritable foci within taut bands of skeletal muscle (22), may develop. Sustained, repeated contraction of the affected muscle can aggravate these conditions (6). Finally, this constant hyperextension/strain on the lower back also can lead to accelerated degenerative changes of the lumbar spine structures and exacerbate osteoarthritis. Nerve root stretch may also occur from possible traction due to the supine leg lift (11).

BIOMECHANICAL CONSIDERATIONS OF THE SUPINE DOUBLE LEG LIFT

A biomechanical description of the exercise also helps to define possible pathokinesiological damage. The psoas, a 16 square inch, pinnate muscle, exerts 1360 pounds of force in full contraction (85 lb/square inches or psi) (13). (For comparison a 140 lb. woman standing barefoot, an area of about 27 square inches, exerts a force, or pressure, of 5.2 psi.) Since the iliacus joins to make a bipinnate muscle, most of the strength is transmitted to the tendon. Michele (13) has reported averages of 1000 pounds of tensile pull due to frictional loss and a mechanical disadvantage in the pulley-like arrangement at the ilipectineal shelf (2,12). When the iliopsoas contracts, it will cause the following to occur: 1) flex, outwardly rotate, and adduct the hip, 2) flex the lumbar spine, and 3) hyperextend the lumbar region, (c.f. Psoas Paradox, 18). The double tendon insertion of this muscle on the lesser trochanter of the femur is a strong connection on a solid structure. The origin of the iliopsoas is

Lateral sit-up. This exercise is the curl-up with a trunk twist (3,5) (Figure 4). The rectus abdominus is the major working muscle. The reverse trunk curl. As the knees and hips are flexed, the knees are drawn toward the chest. In contrast to the former technique, this curl commences at the lower spinal levels. All abdominals are active (23). The obliques are more active and the hip flexors do not encounter great resistance. A twist, dropping the legs to the side, can be added for further muscular activity. Sarno (20) suggests a lateral sit-up, which also strengthens the oblique muscles as follows: Bend both knees and lift them toward the left
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shoulder. Tuck in the chin and reach both hands toward the right hip. Hold for a count of three and relax, then reach toward left hip while the knees are lifted toward the right shoulder and hold for a count of three and relax. (Figure 5).

More difficult abdominal exercises are suggested by Flint (5) or by Sarno’s (20) lateral sit-up. Variations include a “bicycle” exercise (supine position, raising trunk, bring left elbow to the right knee and hold 2-3 seconds, then reverse). Crunch sit-ups and “V” sit-ups, with a rounded back to insure abdominal muscle work (Figure 6) are effective and elicit high abdominal muscle action potentials on EMG (5,17,18,23) but also invoke hip flexor action. The legs should not be held off the floor between repetitions. This would increase the lordotic curve and equate with a leg lift. These exercises (the bicycle, the crunch, and the “V”) are advanced and should only be used by people with already well-developed abdominal muscles.

CONCLUSIONS

In consideration of all the possible pathological problems occurring with the supine double leg lift, this exercise is clearly contraindicated for people with weak abdominal muscles and for low back pain patients. It not only has poor strengthening benefits for the abdomen but also the action is likely to hyperextend the lordotic curve and put unnecessary stress and strain on the vertebrae and abdominal muscles. This exercise may precipitate the very condition the individual desires to preclude. Superior, more appropriate abdominal exercises are available. I suggest that the trunk curl with knees flexed 45-65 degrees, shoulders elevated until the scapula leaves the mat, with a trunk twist, and with the feet unsupported, (3) or Sarno’s (20) lateral sit-up, are safe and effective abdominal exercises eliciting greater rectus and oblique activity.

ACKNOWLEDGEMENT

This study was supported in part by the National Institute for Handicap Research, Grant No. USDE-G0083400043.

REFERENCES

The Relationship of Athletic Injury to Life Stress, Competitive Anxiety and Coping Resources

Brian Blackwell, MS, ATC
Penny McCullagh, PhD

ABSTRACT: Research on the relationship between life stress and injuries has recently emerged as a topic of interest among athletic trainers, coaches, and sport psychology researchers. The present study examined the relationship between life stress factors, competitive anxiety and coping resources of 105 Division I football players and the injuries they incurred throughout a season of play. The findings indicated that injured players scored high on all the life stress factors and competitive anxiety and lower on coping resources than uninjured players. This finding, while not statistically significant for all the scales employed, supported previous research which has shown a relationship between life stress and injuries.

Numerous injuries occur as a result of participation in athletics. In fact, researchers have documented over one million injuries in interscholastic activities (8) and reducing them is the goal of every sports medicine professional. Not only do injuries detract from individual performance, they also have a negative impact on team objectives. Traditionally, researchers have attributed injuries to physiological factors such as lack of training and overtraining or environmental factors such as equipment and the type of sport. Recently, however, researchers have begun to relate the occurrence of injuries to psychological factors. The purpose of the present investigation is to examine the relationship between psychological factors and athletic injuries in a Division I collegiate football program.

PURPOSE

The limited scope of research examining psychological factors and injuries prompted Andersen and Williams (1) to propose a theoretical model that includes many factors that may contribute to injury. Within the model, personal as well as situational factors are hypothesized to mediate the stress response, which in turn influences injury. Specifically the model predicts that personality factors (e.g., locus of control, anxiety, achievement motivation), history of stressors (e.g., life events, daily hassles), and coping resources (e.g., social support, coping behaviors) can all influence how the athlete appraises a situation. These factors impact the physiological and attentional aspects of performance which can lead to injury. An abbreviated version of the model is illustrated in Figure 1.

The present investigation was designed to examine the relationship between hypothesized antecedents (personality, stressors, coping resources) from the Andersen and Williams model and athletic injuries. The personality variable assessed was competitive trait anxiety as assessed by Martens' (9) sport competition anxiety test (SCAT). The SCAT was developed to “provide a reliable and valid instrument for measuring competitive A-trait. Competitive A-trait is a construct that describes individual differences in the tendency to perceive competitive situations as threatening.” (9, p. 36). It was predicted that athletes scoring high on competitive anxiety would have more frequent and more severe injuries than athletes who scored low on competitive anxiety.

To assess history of stressors, two inventories were used: the Athletic Life Event Scale (ALES) (11) and the Daily Hassles Scale (DHS) (7). The ALES assesses major stressful events such as death, divorce, or serious illness in the family as well as problems related to athletics such as conflicts with coaches or changes in playing status. The ALES is designed to determine the direction of the impact (positive or negative) as well as the magnitude of impact (0 - no effect, 3 - great effect). The DHS assesses minor daily irritations that may also contribute to the stress response. It includes items related to class assignments, minor problems with girlfriend, etc. It was predicted that athletes with high life stress would be more likely to sustain injuries than athletes with low life stress.

Coping resources were assessed using the coping resources (CR) section of the Stress Audit Questionnaire (10). This scale attempts to assess whether athletes have resources (e.g., friends, family, proper eating and sleeping habits) to help them cope with stress. For this measure it was predicted that athletes with low coping resources were more likely to sustain injuries. In addition to assessing three categories of moderator variables, we also developed a more precise measurement of injuries than had been used in previous investigations.

METHODOLOGY

The subjects were 105 Division I college football players who volunteered for the study and signed consent forms before participation. They ranged in age from 18 to 22 years; 75 were on scholarships.
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Subjects completed the four previously described scales designed to assess personality (SCAT), history of stressors (ALES and DHS), and coping resources (CR) factors. The first three scales were completed before the football season began, whereas the DHS scale, which was not obtained until late in the season, was administered at the end of regular season play. Injuries were recorded throughout the season by a Certified Athletic Trainer and tabulated daily from treatment records. Mild injuries were those requiring treatment, but no modification of activity. Moderate injuries required treatment and some modification of activity (e.g., intensity, mode or duration) but not missing practice. Severe injuries were those which required some period of nonparticipation. Some of these were season ending injuries.

RESULTS
The means and standard deviations for the injured and uninjured players on the ALES, SCAT, DHS, and CR scales are shown in Table 1. To determine if injured athletes had higher stress and hassles and lower coping resources than non-injured players, independent t-tests were run on the six dependent variables shown in Table 1. In line with the predictions, the direction of means indicated that injured players scored higher than uninjured players on all categories except coping resources. However, the injured players scored significantly higher than the uninjured players only on the ALES total scale ($t(103)=2.02, p<.05$). The means scores for each scale were also categorized according to severity of injury and these data are also reported in Table 1.

We sought to determine if players who scored higher on the anxiety and life stress inventories were more likely to receive injuries than players who scored extremely lower and if players who scored low in coping resources sustained more injuries than players who scored high. To test these hypotheses, players scoring in the highest and lowest quartile (25%) of each of the inventories were compared using chi-square analysis. This procedure allowed us to determine if players scoring on the high and low extremes of the inventories differed significantly as to whether they did or did not receive injuries (Table 2) and whether they did or did not receive severe injuries (Table 3). When players who scored highest and lowest on the scales were compared, the ALES total score produced significant results. Players scoring very high on this inventory had a greater chance of being injured (59.5%), whereas subjects who scored low were more likely to remain uninjured (75%). Table 2 shows this same pattern for all the stress scales but not the coping resources. In general, athletes with high stress were more likely to be injured than athletes with low stress and athletes with high coping resources were less likely to incur injury.

We also compared those players who scored on the extremes of the scales and were either severely injured or not (Table 3). While the number of such injuries was relatively small, two of the scales produced significant chi-square results. Those athletes who scored highest on the ALES positive scale were more likely to be severely injured (54.4%) than subjects who scored lower (21.4%). Subjects who scored lowest on this sub-scale were more likely not to have received a severe injury (78.6%) than those athletes who scored highest (45.7%).

The Sport Competition Anxiety Test also produced significant results. High anxious players had a high incidence of severe injuries (70%) compared to subjects with lower SCAT scores (30%).

DISCUSSION
The present study supports previous investigations (3,4,11) that have found a relationship between life stress and athletic injuries. The results comparing overall mean scores on the inventories were statistically significant only for the ALES total score indicating that injured players scored higher on this scale than uninjured players. Inspection of the other inventories indicated that injured players scored higher than uninjured players on the life stress factors, daily hassles inventory and competitive anxiety scale and lower on the coping resources inventory; although none of these scales showed significant differences.

When subjects were categorized according to extremes on the scales, the differences were more pronounced, especially when severe injuries were considered. One interesting finding is that those subjects who scored high on the ALES positive scale had a higher percentage of severe injuries than those subjects who scored very low. While this finding may at first seem surprising, inspection of individual items on the scale indicate how this could occur. For example while “major increase in team responsibilities” could be viewed as being extremely positive, it could also add considerable stress during future practices and games.

In 1967, the Social Readjustment Rating Scale was developed to assess life stress (6). Subsequent research using this inventory indicated that life stress factors were related to illness (12). Previous research by Holmes (5) also found that life stress was related to injuries in football players. Since these early investigations, researchers have revised the
scale (2,11) to make it more applicable to sport and have continued to examine the relationship between injuries and psychological factors. In general, the findings have been relatively consistent. Using the Social and Athletic Re-adjustment Rating Scale (SARRS), researchers have found that college football players who ranked high in life stress factors were more prone to injury (3,4) than players low in life stress. In an attempt to delineate additional factors that might contribute to this relationship, Passer and Seese (11) examined life stress factors as well as anxiety and locus of control. Neither of the latter factors was found to be related to injury; although life stress (in this case negative factors) was found to be related. One recent study that has produced results contrary to those summarized, found no relationship between life stress factors and injuries in volleyball players (13). However these researchers used the National Athletic Injury Reporting System (NAIRS) and this injury classification system may not be sensitive enough to detect the modest relationships that might be expected in low-risk, non contact sport.

Many previous studies (3,11,13) employed the injury classification system using the standards of the National Athletic Injury Reporting System (NAIRS). Within this classification system, a minor injury is one where the athlete returns to play within 7 days; with a moderate injury the athlete returns to play within 8 to 21 days and with a major injury the athlete loses more than 21 days. For this study, NAIRS seems unsuitable because: (a) Many

Table 1. Mean scores for ALES, SCAT, DHS, and CR for injured and uninjured players and for severity of injury

<table>
<thead>
<tr>
<th>Injury Status</th>
<th>No. of Players</th>
<th>ALES Total M SD</th>
<th>ALES POSITIVE M SD</th>
<th>ALES NEGATIVE M SD</th>
<th>SCAT M SD</th>
<th>DHS M SD</th>
<th>CR M SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injured</td>
<td>81</td>
<td>62.1 48.0</td>
<td>5.9 4.6</td>
<td>17.4 15.5</td>
<td>14.6 21.1</td>
<td>4.1 6.4</td>
<td>3.5 14.8</td>
</tr>
<tr>
<td>Uninjured</td>
<td>24</td>
<td>41.4 25.9</td>
<td>5.7 5.7</td>
<td>15.5 15.1</td>
<td>21.1 4.2</td>
<td>5.5 3.1</td>
<td>15.1 3.0</td>
</tr>
</tbody>
</table>

Table 2. Comparison of injured and uninjured players on extreme quartiles of psychometric scales

<table>
<thead>
<tr>
<th>TEST</th>
<th>Injured n</th>
<th>%</th>
<th>Uninjured n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALES Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo ≤ 30</td>
<td>17</td>
<td>40.5</td>
<td>9</td>
<td>75</td>
</tr>
<tr>
<td>Hi ≥ 74</td>
<td>25</td>
<td>59.5</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>x²(1) = 4.5, p &lt; .05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALES Positive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo ≤ 2</td>
<td>20</td>
<td>41.7</td>
<td>8</td>
<td>66.6</td>
</tr>
<tr>
<td>Hi ≥ 7</td>
<td>28</td>
<td>58.3</td>
<td>4</td>
<td>33.3</td>
</tr>
<tr>
<td>x²(1) = 2.4, p &gt; .05</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALES Negative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo ≤ 8</td>
<td>22</td>
<td>50</td>
<td>9</td>
<td>60</td>
</tr>
<tr>
<td>Hi ≥ 20</td>
<td>22</td>
<td>50</td>
<td>6</td>
<td>40</td>
</tr>
<tr>
<td>x²(1) &lt; 1, p &gt; .05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCAT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo ≤ 19</td>
<td>22</td>
<td>45.8</td>
<td>7</td>
<td>58.3</td>
</tr>
<tr>
<td>Hi ≥ 25</td>
<td>26</td>
<td>54.2</td>
<td>5</td>
<td>41.7</td>
</tr>
<tr>
<td>x²(1) &lt; 1, p &gt; .05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DHS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo ≤ 3</td>
<td>18</td>
<td>39.1</td>
<td>9</td>
<td>56.3</td>
</tr>
<tr>
<td>Hi ≥ 8</td>
<td>28</td>
<td>60.9</td>
<td>7</td>
<td>43.7</td>
</tr>
<tr>
<td>x²(1) = 1.4, p &gt; .05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo ≤ 13</td>
<td>2</td>
<td>6.7</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Hi ≥ 17</td>
<td>28</td>
<td>93.3</td>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td>x²(1) &lt; 1, p &gt; .05</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Table 3. Comparison of players who were severely injured and not severely injured on extreme quartiles of psychometric scales

<table>
<thead>
<tr>
<th>TEST</th>
<th>Severely Injured</th>
<th>Not Severely Injured</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALES Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo ≤ 30</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>Hi ≥ 74</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>x²(1) = 1.0, p &gt; .05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALES Positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo ≤ 2</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>Hi ≥ 7</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>x²(1) = 4.7, p &lt; .05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALES Negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo ≤ 8</td>
<td>9</td>
<td>22</td>
</tr>
<tr>
<td>Hi ≥ 20</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>x²(1) &lt; 1, p &gt; .05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCAT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo ≤ 19</td>
<td>6</td>
<td>23</td>
</tr>
<tr>
<td>Hi ≥ 25</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>x²(1) = 4.1, p &lt; .05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DHS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo ≤ 3</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>Hi ≥ 8</td>
<td>13</td>
<td>22</td>
</tr>
<tr>
<td>x²(1) &lt; 1, p &gt; .05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo ≤ 13</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Hi ≥ 17</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>x²(1) = 1.5, p &gt; .05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
athletes may be injured but never miss a day of practice; (b) Missing collegiate play for up to 7 days can really not be considered mild; (c) It may be necessary to use a more sensitive system if psychological variables are being used as predictors. Therefore, a more sensitive injury classification system was developed.

IMPLICATIONS
These findings add information to a growing body of literature which points to the contribution of psychological factors in athletic injuries. At present, two plausible explanations have been posited to explain the relationship. According to Andersen and Williams (1), personality factors, history of stressors, and coping resources may all influence the stress response which in turn influences injury. First, stress may lead to an increase in muscle tension that can change flexibility and therefore cause injuries. Second, (due to increases in stress) athletes may narrow their attentional field and fail to pick up important environmental cues that would help them avoid injury situations. While research has not yet clearly determined how each of these mechanisms may contribute primarily to injury, we suggest that coaches and athletic trainers alike should be aware of the psychological status of their athletes so potentially hazardous situations can be avoided. At the present time the Andersen and Williams model provides a framework upon which future research can be based. Another factor presented in the model, but not examined here, is the role of interventions in preventing injuries. Andersen and Williams have suggested potential interventions for reducing the cognitive appraisal of stress (e.g., confidence training, fostering team cohesion) as well as interventions for the attentional and physiological aspects of the stress response (e.g., relaxation, imagery). The present study was an initial attempt to test variables specified within the recently proposed model of stress and athletic injury (1). Since the model is just beginning to receive empirical testing, it is somewhat premature to offer definite solutions for injury reductions. However, coaches, athletic trainers and athletes should be aware of the numerous psychological variables in addition to physical variables that may impact on injury.

ACKNOWLEDGMENT
We would like to thank the University of Colorado sports medicine staff, football coaching staff, and the athletes for their cooperation.

REFERENCES
Chronic Compartment Syndrome In Athletes: Recognition and Treatment

Dominic L. Di Manna, MS, ATC
Peter G. Buck, MD

ABSTRACT: Compartment syndrome is a condition in which increased pressure within a limited space impairs the circulation and function of the tissues within that space. A chronic form of compartment syndrome has been identified in participants in many sports, especially those which are ballistic in nature, such as track and soccer. Chronic Compartment Syndrome (CCS) is associated with activity related pain. The most common area of the body to be affected by the exercise-induced compartment syndrome is the lower leg. Symptoms of this condition may be confused with those of "shin splints," stress fractures and muscular strains. Consultation with the team physician is important because of the complexities of this condition. Diagnostic aids such as bone scans and intracompartmental pressure measurements are essential for accurate diagnosis and treatment. The traditional management protocols of external compression and elevation worsen the syndrome. Conservative care has been shown to be ineffective. In severe or persistent cases, surgery is often necessary to alleviate symptoms and facilitate the athlete’s return to competition.

Chronic, exercise related lower leg pain is seen in many sports (11,17,20,23). The pain may be related to a strain, contusion, stress fracture or "shin splints." In some cases the athlete may suffer from a much more severe condition, chronic compartment syndrome (CCS) (1,7,8,12,14,21).

CCS is also known as medial tibial stress syndrome (1,8,17), intermittent claudication (10), and exertional compartment syndrome (8).

This condition may present itself in much the same manner as the other conditions mentioned above. The chronic form of this condition is associated with an increase in the pressure in the compartments of the lower leg which, if left untreated, may lead to nerve and muscle damage (12). The purpose of this article is to define CCS and to identify its unique and specific symptoms. This information will assist the athletic trainer/team physician in the recognition and treatment of the syndrome.

Despite the different nomenclature for this condition, previous authors and researchers agree that CCS be defined as a condition in which increasing pressure within a limited space compromises the neurovascular function of the tissues within that space (6,13,18).

ETIOLOGY AND PATHOLOGY

As presented in Figure 1, the lower leg has four myofascial compartments: the anterior, lateral, superficial, and deep posterior (3). Table 1 lists structures, functions and nerve innervations of each of the compartments (3,9).

Experts agree that the most commonly affected compartments in CCS are the anterior and deep posterior compartments of the lower leg (2,6,7,20,23).

The literature identifies two basic etiologies which may lead to CCS: decreased compartmental volume and increased compartmental contents. Research indicates that compartmental contents may be increased through exercise or muscle hypertrophy. Interestingly, muscular hypertrophy via body building has not been identified as a cause of CCS.

Compartmental volume may be increased by bleeding, either from a contusion or some other mechanism (12,13,14,15,18,22). The authors postulate that repetitive microtearing of the muscle may lead to bleeding and repeated ischemia of the tissues through the increase of

Figure 1. The Myofascial Compartments of the Lower Leg.
compartmental volume mechanism. Severe contusions and bleeding in the lower leg have been identified as a causative factor in the compartment syndrome in both the acute and chronic forms (13,18).

Studies have reported that a tissue pressure increase of as little as 20 mm/Hg will greatly affect local blood flow to the compartment (4,6,13,18,23,25).

Allen and Barnes (1) reported resting tissue pressure in the anterior compartment of patients with CCS to be 17 mm/Hg. Allen, et al. (2) found pressure in the compartments of the lower legs of these patients to rise as high as 81 mm/Hg with exercise. In a recent article, Nkele (19) observed and reported pressure ranges from 0 to 17 mm/Hg at rest, and from 0 to 60 mm/Hg with exercise. These observations led Nkele to recommend surgery for patients with resting compartmental pressures of 12 mm/Hg or above (19). Rorabeck (23), in a group of 12 athletes with CCS, found resting pressures to range from 11 to 17 mm/Hg. He found pressures to approach 105 mm/Hg. Alien, et al. (2) found pressure in the compartments of the lower legs of these patients to rise as high as 81 mm/Hg with exercise. These observations led Nkele to recommend surgery for patients with resting compartmental pressures of 12 mm/Hg or above (19).

Due to varied recommendations on pressure thresholds in the literature, athletic trainers must consult with the team physician so that findings may be interpreted and the appropriate intervention and treatment undertaken.

**INTRACOMPARTMENTAL PRESSURE MEASUREMENT**

Since the indication of compartment syndrome is elevated tissue pressure, measuring this pressure will allow more expedient diagnosis and treatment (16).

The athletic trainer knows that the acute form of compartment syndrome is a medical emergency. Due to the complex nature of CCS, early recognition and expedient referral to the team physician is the most critical aspect of management on the trainer’s part.

Intracompartamental pressure is measured in three ways. These are: the needle technique of Whitesides (30), the wick catheter technique of Scholander (2,16), and the slit catheter technique developed by Rorabeck (24,25). All of these techniques involve inserting a needle into a muscular compartment and measuring via a transducer.

These techniques are well described in the literature. The most useful summary is provided by Mubarak (16). Again, consultation with the team physician will determine the best technique to use in a given situation, since facilities, equipment and expertise in the use of various techniques will vary.

In order to facilitate diagnosis, researchers and experts recommend that pressure readings be taken before, during, and after exercise (17,19,21). Our clinical experience has shown that a few minutes of exercise on a treadmill brings on symptoms so that post exercise readings may be obtained. We have found that taking readings during exercise is somewhat impractical. Pre and post exercise readings are always taken.

The bone scan technique is often helpful in differential diagnosis of CCS in athletes. If positive, the scan will indicate the presence of stress fractures or periostitis, sometimes referred to as “true shin splints.” Stress fractures and/or periostitis may coexist with CCS.

**HISTORY**

CCS may or may not present a clear picture in terms of the athlete’s history. The key is report of pain with exercise and distal paresthesia. The athlete may report that the pain and numbness disappear with a period of rest and inactivity.

In order to differentiate CCS from the other causes of lower leg pain, exercise periods with pain and paresthesia should be clearly noted. The athlete should also be questioned to ascertain the exact pattern and duration of the painful symptoms and episodes. The athlete may describe the activity related pain as: ache, tightness, squeeze, cramping, sharp pain, or pressure (13). The athlete’s complaint of distal paresthesia is a significant finding.

To aid in locating the exact areas of pain and/or numbness, the athlete can outline with a finger or a pen the exact areas of discomfort. In CCS, the athlete will frequently describe symptoms in the anatomic area of a muscle compartment, not one localized area. Distal pulses are likely to be present since systolic pressure is greater than that of compartmental pressure (11-13).

**PHYSICAL TESTING AND EVALUATION**

Physical examination may be unrevealing if the CCS is not active. Exercise before the examination is often helpful. Palpation of the leg will reveal tight areas along the course of the muscular compartment. The examiner may be able to detect muscle herniations as well. Muscle testing will reveal pain on passive stretching in a pattern that is consistent with the muscle groups contained within the affected compartment. The literature indicates that pain on passive stretching is a classic pattern associated with CCS (11,12,13). Hypesthesia and paresthesia may also be present.

Matsen (13) indicates that having the athlete wiggle his or her toes may be a misleading test, since an athlete with loss or impaired function of the anterior compartment may be able to use the toe flexors to bring the toes down, and then allow the toes to spring back into normal position.

**TREATMENT**

In athletes suspected of having CCS, consultation with the team physician is essential so that symptoms may be clearly discussed and the proper course of treatment decided upon. The athletic trainer plays a critical role in the early detection of the syndrome and the expedient referral of the athlete to the physician for evaluation.

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exacerbate the painful symptoms (13,18). Elevation of the limb increases tissue pressure by reducing arteriolar pressure. External compression limits an already limited myofascial compartment. This has been shown in our clinical experience as well.

Conservative treatment is ineffective for athletes with CCS. If the symptoms are severe enough, the athlete must either give up aggravating sports or have surgery.

Fasciotomy, in which the fascia of the compartment is surgically split along the entire length of the muscular compartment, is the accepted method of decompressing the compartment to facilitate the athlete’s return to sports (10,21,26-28).

A physician may recommend fasciotomy under three conditions—when an athlete has an unacceptable limitation of activity because of pain; when significant neurologic deficits are present; or when the athlete has painful symptoms at rest.

For CCS, the subcutaneous fasciotomy is done on an outpatient basis. Two small incisions are made, one at the junction of the proximal and middle third of the leg and the other at the junction of the middle and distal third. All involved compartments must be released. General or local anesthesia may be used.

Results of fasciotomy have been very good, with eventual return to sports participation in 80-85% of athletes treated (21,26). Unsatisfactory outcomes result from inaccurate diagnosis, inadequate release of the compartment, or failure to release all of the involved compartments.

POST-OPERATIVE CARE AND REHABILITATION GUIDELINES

Post-operatively, the patient’s leg is placed into a well padded compression dressing with a posterior plaster splint. Elevation of the extremity and intermittent application of ice are important during the first 48 hours following surgery. Crutches are necessary for a week or two. Weight bearing is allowed as tolerated. When good dorsiflexion strength returns, the splint may be discontinued.

Rehabilitation is to be instituted early, with isometric contraction of the muscles about the knee and ankle. Ankle and knee exercises are also performed. TENS is occasionally used for pain relief and pulsed electrical stimulation may be used to control swelling. After anterior compartment fasciotomy, the ankle dorsiflexors must be strengthened gradually. Friction massage is used to prevent scar tissue from tethering the fascial release.

Swimming and stationary cycling are instituted when normal active motion is developed in the different ankle muscle groups. Running should not be attempted until adequate strength and full range of motion have been attained. The patient should be able to walk briskly without pain or a limp before graduating into a running program. Some individuals may return to active sports within four weeks, others may take as long as three months depending upon the duration and severity of symptoms before surgery.

CONCLUSIONS

CCS raises the tissue pressure of the compartments of the lower leg. This condition has symptoms similar to other conditions which cause exercise related lower leg pain in athletes. A careful history and physical exam alerts the athletic trainer to the possibility of CCS. The compartments that are most commonly affected are the anterior and deep posterior compartments of the lower leg. The condition is most often found in athletes who participate in ballistic sports such as track, soccer, and ballet.

The athletic trainer plays a critical role in the early recognition of symptoms and referral of the athlete to the team physician. The physician may need to use adjunct tests such as bone scans and intracompartmental pressure measurements to arrive at a definitive diagnosis.

Traditional protocols of external compression and limb elevation have been shown to aggravate the condition. Ice and TENS serve as adjuncts to pain relief. In severe or persistent cases, fasciotomy may be necessary in order to relieve the syndrome. Fasciotomy has been shown to facilitate the athlete’s return to competition. A review of the literature has shown that conservative care is ineffective. The information in this article will assist the athletic trainer/team physician in the recognition, treatment and differentiation of CCS from other causes of exercise related lower leg pain in athletes.

REFERENCES


---

LUMP BETWEEN LOWER LIP AND GUM.

BAD BREATH.

STAINED FINGERS.

TOBACCO-STAINED TEETH.

WHITE PATCHES AND SORES. *Leukoplakia*. In time, could lead to oral cancer.

RECEDING GUMS.

TOBACCO JUICE.

TWITCHY, WIRED LOOK CAUSED BY NICOTINE.

A high nicotine content makes smokeless tobacco just as addicting as cigarettes.

STUBBORN ATTITUDE. WON'T LISTEN TO SOUND MEDICAL ADVICE.

DRIBBLE CUR TIN BULGES AND RING.

NO FRIENDS.

HOW TO SPOT A DIP.

DIPPING IS FOR DIPS. DON'T USE SNUFF OR CHewing TOBACCO.
**PREVENTS ATHLETIC LEG CRAMPS**

**Features and Benefits:**

FOSFREE® provides more physiologically utilizable calcium for the athlete.

FOSFREE® provides the best tolerated iron in an iron demand format for optimum patient acceptance.

FOSFREE® provides comprehensive supplementation in an odorless, “no burp” formula.

FOSFREE® is a cost effective calcium iron and vitamin supplement.

**Specific Uses:**

FOSFREE® is a specific choice in the treatment of hypocalcemic tetany.

FOSFREE® is an excellent supplement for young athletes.

FOSFREE® is a supplement of choice in any calcium deficient athlete.

**Composition:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Each tablet contains</th>
<th>%USRDA*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soluble Calcium</td>
<td>Calcium ............... 175.5 mg.</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>(Calcium Lactate)</td>
<td>250 mg.</td>
</tr>
<tr>
<td></td>
<td>(Calcium Gluconate)</td>
<td>250 mg.</td>
</tr>
<tr>
<td></td>
<td>(Calcium Carbonate)</td>
<td>300 mg.</td>
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<tr>
<td>Soluble Iron</td>
<td>Iron .................. 14.5 mg.</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>(Ferrous Gluconate)</td>
<td>125 mg.</td>
</tr>
<tr>
<td>Fat Soluble Vitamins</td>
<td>Vitamin D ............. 150 I.U.</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>Vitamin A Acetate</td>
<td>1500 I.U.</td>
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<tr>
<td></td>
<td>Vitamin C (Ascorbic Acid)</td>
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<tr>
<td>High B-complex</td>
<td>Vitamin B1 (Thiamine Mononitrate)</td>
<td>5 mg.</td>
</tr>
<tr>
<td></td>
<td>Vitamin B6 (Pyridoxine HCl)</td>
<td>3 mg.</td>
</tr>
<tr>
<td></td>
<td>Vitamin B2 (Riboflavin)</td>
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</tr>
<tr>
<td></td>
<td>Vitamin B3 (Niacinamide)</td>
<td>10 mg.</td>
</tr>
<tr>
<td></td>
<td>Vitamin B5 (d-Calcium Pantothenate)</td>
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</tr>
<tr>
<td></td>
<td>Vitamin B12 (Crystalline on Resin)</td>
<td>2 mcg.</td>
</tr>
</tbody>
</table>

*U.S.R.D.A.: U.S. recommended daily allowance for adults and children 4 or more years of age.

**Action and Uses:**

FOSFREE® tablets are primarily indicated as a general calcium supplement, athletic, prenatal, postpartum or geriatric supplement particularly when soluble calcium salt supplementation is desired. FOSFREE® is a specific choice for the prevention of hypocalcemic tetany in athletes.

**Administration and Dosage:**

Two FOSFREE® tablets taken one hour pre-work and contest and two tablets at bedtime are indicated for athletes suffering from daily or nocturnal tetany. Four to six tablets one hour pre-contest for the athlete who only suffers cramping during contest.

**How Supplied:**

FOSFREE® is supplied as a yellow, bolus shaped, coated tablet, in bottles of 100 (NDC 0178-0031-01) and 500 (NDC 0178-0031-05).
ABSTRACT: Concern has been expressed in recent years about the high rate of attrition of sportsmedicine personnel. The purpose of this study was to determine why certified athletic trainers were no longer employed in the profession. The sample consisted of 82 certified athletic trainers from the western United States. Results from this study indicated that the chance to work with people, the type of work, and feeling a sense of achievement in the job led to job satisfaction and were the main reasons cited for initially becoming an athletic trainer. Extrinsic factors such as time commitments, salary, limited opportunities for career advancement, poor work conditions, and conflicts with other people working with the athletes were related to job dissatisfaction and were major reasons cited for no longer working as an athletic trainer. Further research is needed to determine causes of attrition, e.g., whether it is due to burnout. The results point to immediate practical implications, such as how athletic trainers can cope with negative factors and make the most of positive factors of the job, and what administrators can do to alleviate factors in the work place that lead to job dissatisfaction and attrition.

Attrition in any profession is a major concern, and athletic training is no exception. The “leaver” may experience negative effects; continuity in relationships with clients may be lost; and time and money must be spent to advertise for, interview, hire, and train new personnel. Since the leaver, the clients, and the organization all suffer, factors which may contribute to attrition need to be identified.

To date, no studies have investigated attrition in athletic trainers. It is postulated that the numerous pressures on athletic trainers result in a high rate of attrition. Human relations are central to the success of an athletic trainer, and pressures result from the need to continuously interact with players; to get players back to action quickly; and to play the roles of disciplinarian, parent, public relations expert, and sports psychologist. When these roles conflict, or when the athletic trainer’s need for meaning and fulfillment on the job is not met, the result may be anger, frustration, psychosomatic illness, absenteeism, or leaving the job.

Many other factors could influence an athletic trainer to leave the profession, e.g., promotion opportunities, personal career interests, or the job market. It is essential to understand factors specific to one profession which may be important in an individual’s deciding to leave a job or the profession entirely.

The purpose of this study was to determine why athletic trainers were no longer employed in the profession. Many previous studies of attrition (5,8,11) included individuals in the sample who remained in the activity or profession, but who indicated reasons why they were likely to leave. The current study included only athletic trainers no longer working in the profession.

METHOD
Two-hundred-nineteen persons ineligible for a previous study (1) because they were no longer employed as athletic trainers, were sent a second questionnaire designed to determine why they had left the profession. Ninety-nine (45%) returned the questionnaire. One reason for this low rate of return could be lack of interest in a profession in which one is no longer employed.

Seventeen (8%) of the 99 had never been employed as an athletic trainer therefore were excluded from the study. Thus, 82 (37%) certified athletic trainers were the sample for this study. Fifty-nine (72%) of these had left the profession entirely, while 23 (28%) considered themselves still in the athletic training profession, but not as a practicing athletic trainer, e.g., they taught athletic training. All individuals who had left the profession or changed jobs within the profession did so voluntarily, not because they were made redundant or for any other reason.

The questionnaire included 22 questions to determine: (a) information about the individual, (b) information about the institution(s) for which the individual had worked, (c) reasons for entering the athletic training profession, (d) reasons for leaving the profession, and (e) current employment status. These questions included open-ended questions to determine the most important reasons for not currently working as an athletic trainer and for entering and leaving the profession, and closed questions to determine the relative importance of 44 reasons for leaving the profession. These were in a 7-point Likert-type format, from “not important” to “very important”.

Content validity was determined by first asking athletic trainers for possible reasons for leaving the profession, and also considering reasons coaches gave for leaving the profession. Those reasons given by coaches which could be relevant to athletic trainers were then included with those given by the athletic trainers to form a thirty-one item questionnaire.

Reliability of the questionnaire was established by the test-retest method. I sent questionnaires to ten clinical athletic trainers, and one week after it was returned, I sent a second one. Only questions with a reliability coefficient greater than .60 were used; 22 of the original 31 questions met this criteria. Their average reliability coefficient was r = .78 (range .62 to .90). These 22 questions were included in the final questionnaire.

I also attempted to ensure that the sample was representative of all athletic trainers not currently working in the profession. The questionnaires returned by the 219 people for the original study (1) were analyzed to detect any differences between those who returned the second questionnaire and those who did not.

Susan Capel is an associate professor in the School of Human Movement Studies at Bedford College of Higher Education, 37 Lansdowne Road, Bedford MK40 2BZ, England.
RESULTS
Although the response rate was low, it appears it was random, as indicated by the following ratios between those who returned the second questionnaire and those who did not: males - 51.5%; females - 49.47%; average age - 31.3:34.5 years; married - 56.61%; years as a certified athletic trainer - 7.9:8.7 years; years employed in the profession - 4.5:4.6 years; worked alone in the last job held as an athletic trainer - 62.69%.

Profile of Respondents and Athletic Training Status
Considerable variability existed among respondents and their athletic training status (Table 1). Perhaps the most interesting finding of these profiles was the age and lack of professional experience of many respondents - 75% of respondents were less than 36 years old, 75% had been certified for 10 years or less, and 50% had been employed in the profession for less than 5 years.

Reasons For Entering/Most Enjoyable Aspects of the Profession
Table 2 shows the relative importance of six reasons for becoming an athletic trainer. Once in the profession, the two factors found most enjoyable were contact with athletes and professional activities - rehabilitation, safety, taping, treatment (Table 3).

Reasons For Leaving/Least Enjoyable Aspects of the Profession
A wide variety of reasons were given as the primary reason for leaving the athletic training profession (Table 4). In addition, respondents indicated secondary factors which contributed to the decision to leave the profession. Six factors contributed most to the decision. These were: another occupation interested me (x = 4.78); wanted to get more education (x = 4.60); too much time consuming (x = 4.44); not enough opportunity to advance as an athletic trainer (x = 4.44); wanted to spend more time with my family (x = 4.14); and low pay (x = 4.02). Primary and secondary reasons for leaving the profession did not always correspond to the aspect of the job described as least enjoyable, as shown in Table 5.

Current Employment Status
Many of the respondents were currently employed in fields closely related to athletic training or physical activity, i.e., as a physical therapist, physician, nurse, orthopedic physician's assistant, exercise specialist, physical education teacher, adapted physical education teacher, athletic training teacher, athletic training program director, coach, or doing other work in clinical services or sports medicine which they did not specify (Table 6). The other respondents, instead of working in an allied field, returned to graduate school in a different area of study, or worked in a completely unrelated field.

Fifty-seven percent of the sample indicated that the demand (cost) of athletic training was too great (e.g., too many different things to do, having to do things not trained for, too many different people to please); 91% indicated that the effort of the job was worth the time commitment; 58% indicated that they would apply for another athletic training job, although many qualified this by describing conditions under which they would return.

| Table 1. Profile of respondents and athletic training status (N=82) |
|------------------------|--------|--------|---------|-----|-------|
| Question               | Mean   | SD     | Range   | N   | Percent |
| Age (yr):              | 34.5   | 7.9    | 23-57   |     |         |
| Sex:                   |        |        |         |     |         |
| M:                     | 35     | 43     |         |     |         |
| F:                     | 47     | 57     |         |     |         |
| Marital Status:        |        |        |         |     |         |
| Married:               | 50     | 61     |         |     |         |
| Single:                | 30     | 37     |         |     |         |
| Number of Yrs as ATC:  | 8.7    | 5.4    | 2-29*   |     |         |
| Route to Certification as Athletic Trainer: |
| Undergrad curriculum:  | 36     | 44     |         |     |         |
| Grad curriculum:       | 18     | 22     |         |     |         |
| Internship:            | 28     | 34     |         |     |         |
| Time Employed as an Athletic Trainer (yrs): |
| Total:                | 4.5    | 4.4    | 1-29    |     |         |
| Full-time:            | 3.4    | 4.2    | 1-29    |     |         |
| Part-time:            | 1.7    | 2.8    | 1-14    |     |         |
| Number of Athletic Training Jobs Held: |
| Worked alone:         | 1.4    | 1.1    | 1-4     | 57  | 69     |
| Worked with other Athletic Trainers: |
|                      | 13     | 16     |         |     |         |

*Certification for Athletic Trainers has only been in effect since 1970, or 19 years. Athletic trainers' actual responses are reported here, even though some (7%) cannot be correct.

| Table 2. Reasons for becoming an athletic trainer (N=82) |
|------------------------|--------|-------|
| Reason                  | N     | %     |
| Enjoy working with athletes | 25   | 31  |
| Combine sports with medicine | 20   | 24  |
| Interest in sports       | 9     | 11   |
| Supplement/complement physical therapy training | 7     | 9   |
| Improve care of athletes, worthwhile profession | 5     | 6   |
| Interest in athletic training | 5     | 6   |
| Other                    | 11    | 13   |

| Table 3. Aspects of athletic training described as most enjoyable (N=82) |
|------------------------|--------|-------|
| Aspect                  | N     | %     |
| Working with athletes   | 45    | 55   |
| Professional activities | 15    | 18   |
| Independence/responsibility | 7     | 8   |
| Challenge/diversity    | 4     | 4    |
| Helping/feeling needed  | 2     | 3    |
| Contribution to athletes' safety | 2     | 3   |
| Travel                  | 2     | 3    |
| Other                   | 5     | 6    |
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The Sports Performance System
Performance products from Gatorade

The new Gatorade Sports Performance System provides three scientifically-formulated training table products for your athletes. Developed by sports scientists and nutritionists, Gatorade, GatorLode and GatorPro offer a variety of benefits to help your athletes achieve peak performance during training and competition.

The recommended usage of Gatorade Sports Performance products.

<table>
<thead>
<tr>
<th>BENEFIT</th>
<th>EXERCISE</th>
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<tr>
<td></td>
<td>Before</td>
<td>During</td>
<td>After</td>
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<tr>
<td>GATORADE</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Replaces fluids, carbohydrates,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and electrolytes to improve</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>performance</td>
<td></td>
<td></td>
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<tr>
<td>GATORLODE</td>
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<td></td>
<td></td>
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<tr>
<td>High in carbohydrates for</td>
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<td></td>
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<tr>
<td>greater endurance</td>
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<tr>
<td>GATORPRO</td>
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<tr>
<td>Balanced supplement for better</td>
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</tr>
<tr>
<td>nutrition</td>
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</tr>
</tbody>
</table>

Recommended consumption 1-3 hours before activity: 12 ounces GatorLode; 8 ounces GatorPro.

GatorLode and Endurance
GatorLode® Drink Mix provides the carbohydrate energy your athletes need for endurance in training and competition. The major source of energy during intense exercise is muscle glycogen (5). A high-carbohydrate diet can significantly increase stores of muscle glycogen (1, 5), and is particularly effective in the two to three days prior to an athletic event. And muscle glycogen restoration is enhanced when carbohydrates are consumed in the thirty minutes following intense activity (6). Included during or between meals, GatorLode is a convenient, concentrated source of carbohydrates. A suggested daily intake of three great-tasting, 12-ounce servings of GatorLode provides your athletes with the carbohydrate equivalent of two plates of pasta, plus four baked potatoes, plus four slices of bread.

GatorPro and Nutrition
GatorPro™ Sports Nutrition Supplement helps ensure that your athletes maintain a balanced diet. Because a training athlete's diet can be difficult to manage, GatorPro provides a balanced formula of nutrients that makes an excellent snack or supplement at mealtimes. GatorPro is fortified with 22 vitamins and minerals, including B-vitamins, calcium, and iron, which are particularly important to athletes. GatorPro provides your athletes with carbohydrates for their working muscles, and high-quality protein for muscle growth and development (7). Those athletes who may need to lose body fat can replace some of the high-fat, high-calorie foods in their diets with GatorPro. And others can increase or maintain body weight by increasing caloric intake with the help of GatorPro. There are three great-tasting GatorPro flavors: chocolate, strawberry, and vanilla.


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References
Table 4. Primary reason for leaving the profession (N=82)

<table>
<thead>
<tr>
<th>Reason</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter private practice as physical therapist</td>
<td>23</td>
<td>28</td>
</tr>
<tr>
<td>Return to school</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Moved, no job available</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Salary too low</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Limited opportunities</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Enjoyed another job more</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Teach/supervise/direct athletic training programs</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Long hours</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 5. Aspects of athletic training described as least enjoyable (N=82)

<table>
<thead>
<tr>
<th>Aspect</th>
<th>N</th>
<th>%</th>
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<tr>
<td>Long hours/no time for self</td>
<td>30</td>
<td>37</td>
</tr>
<tr>
<td>Salary</td>
<td>10</td>
<td>12</td>
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<tr>
<td>Conflicts with coaches, administrators or others</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Administration and paperwork</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Inability to meet all demands</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Travel</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Poor support for the program</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>16</td>
<td>19</td>
</tr>
</tbody>
</table>

Table 6. Current employment status (N=82)

<table>
<thead>
<tr>
<th>Field</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Therapist</td>
<td>36</td>
<td>44</td>
</tr>
<tr>
<td>Allied Health Professions</td>
<td>13</td>
<td>16</td>
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<tr>
<td>Education</td>
<td>27</td>
<td>33</td>
</tr>
<tr>
<td>Unrelated Fields</td>
<td>6</td>
<td>7</td>
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<tr>
<td>Feelings About Applying for Another Job as an Athletic Trainer:</td>
<td></td>
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<tr>
<td>Would apply</td>
<td>48</td>
<td>58</td>
</tr>
<tr>
<td>Would not apply</td>
<td>34</td>
<td>42</td>
</tr>
<tr>
<td>Major Reasons for Applying for Another Job:</td>
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<td></td>
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<tr>
<td>Important and/or challenging work</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>Contact with athletes</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>Enjoy the profession</td>
<td>22</td>
<td>28</td>
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<tr>
<td>Major Reasons for not Applying for Another Job:</td>
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<td></td>
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<tr>
<td>Poor Salary</td>
<td>24</td>
<td>29</td>
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<tr>
<td>Long hours</td>
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<tr>
<td>Like current job</td>
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<td>15</td>
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<tr>
<td>Did not enjoy the profession</td>
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<td>13</td>
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<tr>
<td>Limited future</td>
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<td>8</td>
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<tr>
<td>Too many “headaches”</td>
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<td>5</td>
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<td>Conflicts</td>
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<td>3</td>
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DISCUSSION

The purpose of this study was to determine why certified athletic trainers were no longer working in the profession. Care must be taken in interpreting the results because of the low return rate. Although analyses showed the sample was similar to those individuals who did not return the questionnaire, alternative explanations must also be considered.

Maslach and Jackson (4) identified a disproportionate share of stress-related difficulties, burnout, and attrition among persons pursuing a career in the helping professions. Daley (2) defined burnout as a crystallized set of attitudes and feelings about work, which tend to be manifested as emotional exhaustion; the tendency to treat clients in a detached, mechanical fashion; and feeling a low sense of personal accomplishment.

Smith (9) developed a model which looked at conditions under which withdrawal can be attributed to burnout. Each individual weighs the rewards and costs of a job, and then compares the outcome (favorable or unfavorable) with what can be expected from alternative jobs. For the athletic trainers in this sample, rewards of the job included work with athletes, professional activities, freedom, responsibility, independence, challenge, and feeling needed/helpful. The costs of athletic training included long hours; conflicts with coaches, administrators, or other personnel; administration and paperwork; and inability to meet all demands. Both reasons for leaving the profession and aspects of the job described as least enjoyable were generally extrinsic factors which resulted in negative experiences (e.g., costs of time and effort, lack of control over career direction within the profession, anxiety and stress). Therefore, early identification of extrinsic aspects of the job perceived as potentially negative and stressful for the individual (e.g., excessive time commitments, conflicts among personnel, excessive administration and paperwork, or work overload where the person feels unable to meet all the demands of the job) may avoid perceiving them as high costs which outweigh the rewards. In deciding to leave the profession, the rewards of athletic training may not have been decreased, but costs may have increased to outweigh the rewards or cause the reward-cost ratio to drop too low.

It does not appear that most of these athletic trainers had a change of interest or value reorientation in their career. Many were currently working in jobs with similar skills and interests, which were perceived as being more attractive than being an athletic trainer. Sources of stress may vary from situation to situation and from individual to individual. Likewise, there are a large number of different reasons for leaving any profession. Results of other studies of attrition showed that people dropped out for many different reasons.

High rates of attrition have been identified (4) in other health professions, such as nursing. One reason for being in a health profession is patient care. Although this can be very challenging and rewarding, it can also be very emotionally demanding. Sources of stress which led to burnout and attrition in this study were identified as poor working conditions; work overload; role conflict; role ambiguity; minimal decision-making power; and the amount of contact with people (patient, patient’s family and friends, and other medical personnel) in emotionally charged situations.

Studies of burnout and attrition in athletic-related populations are limited; although several studies looked at
reasons why volunteer coaches and athletes dropped out of sport. Weiss and Sisley (10) found the four major reasons volunteer youth sport coaches discontinued coaching were time involvement, other leisure interests, conflicts with job, and end of child’s participation in the program. Administrators of youth sport programs can do little about these reasons. The next four reasons, however, were program dissatisfaction (lack of support from program personnel and disagreement with program’s philosophy), problems with unqualified officiating, decline of interest and motivation, and no longer experiencing positive feelings about coaching. These are problems which can be alleviated or controlled by program personnel once they have been identified.

Robinson and Carron (7) found that sport drop out was related to systematic differences in personal factors within groups, and perceptions of specific situational factors. Variables discriminating among groups were found to be the perception of group climate (sense of belonging, enjoyment, closeness); attitudes toward competition (perception of the importance of winning, role of activity in physical fitness development); socialization factors (encouragement received from fathers and from teachers); attributions following athletic outcomes (attributions to ability following failure and effort following success); and leadership (perceptions of the coach as an autocrat).

Gould, Feltz, Horn and Weiss (3) reported the major reason competitive swimmers discontinued swimming was interest in other activities; however, some swimmers discontinued because of excessive pressure, lack of time and/or over-emphasis on winning. This and other studies (6) have identified costs such as fear of failure, excessive competitive pressure, dislike of the coach, interpersonal difficulties with teammates, excessive demands on time and energy, and boredom, as outweighing the rewards of participating in sport, when compared to either not participating or participating in another activity.

Additional research needs to be conducted to determine the causes of attrition. Studies need to be undertaken with samples of people who have withdrawn from athletic training and other professions to build up both a general picture and knowledge specific to each area. As burnout is one factor which may contribute to attrition, knowledge about burnout in general needs to be increased, as well as the situations which may exacerbate burnout. Studies based on the cognitive-affective model of Smith (9) should provide valuable information to determine whether attrition is due to burnout. These could include research to identify what is perceived as the reward-cost comparison level and the alternatives to the activity or job.

Not all attrition is damaging to the individual, the athletes and the organization. Some change of personnel is desirable. However, it is important to identify what immediate, practical steps could reduce attrition that is damaging for the individual athletic trainer, and results in unnecessary lack of continuity in care of athletes, and in advertising for, interviewing and hiring a new athletic trainer. Questions to be addressed include: How can time demands be reduced? How can a career structure be introduced which offers greater opportunities for promotion and/or challenge? Answers to these questions and others will not in themselves prevent attrition, but they may help prevent the reward-cost ratio from dropping below the comparison level for alternative jobs and keep athletic trainers in the profession.

Other findings indicated that the rewards of athletic training (e.g., contact with athletes, enjoyment, challenge) may still be valuable to the individual, and if the costs were lowered (e.g., decreased hours, higher pay, better career structure) the individual may have remained in the profession. For the athletic trainers in this sample, the reasons for entering the profession and the factors found to be most enjoyable, were intrinsic factors which resulted in positive experiences (e.g., close interpersonal relationships, feelings of competence). It is therefore important to identify factors which athletic trainers find rewarding, so that these can be recognized and enhanced to reduce the risk of attrition.

In summary, current athletic trainers, administrators, and others with whom athletic trainers work should be helped to identify high costs of the job. It is also necessary to conduct more studies of attrition and burnout so that attrition resulting from burnout can be reduced.

REFERENCES
ABSTRACT: A clear understanding of muscle activity is necessary for the rehabilitation of the posterior rotator cuff muscles. Electromyographic (EMG) analyses of the supraspinatus, infraspinatus, and teres minor muscles were done to determine optimum exercises for this muscle group. Twenty-eight subjects were studied using fine-wire intramuscular electrodes in each of the three muscles. A series of tests compared many of the standard exercise positions with several more novel concepts. The EMG activity produced in the supraspinatus was maximized when the subject horizontally abducted the externally rotated humerus while prone \((t(50) > 2.0, p < .05)\). The infraspinatus and teres minor EMG activity were maximized in the prone position with an external rotation movement with the glenohumeral joint at 90° and the elbow at 90° \((t(53) > 2.0, p < .05)\).

The use of arthroscopic surgery has allowed orthopaedists to diagnose and treat many shoulder problems without arthrotomy. Pathology of the rotator cuff tendon has been no exception. Andrews et al. (1) have reported success returning athletes with rotator cuff and labrum tears back to their sport after arthroscopic surgery. Return to play depended on an effective program of rehabilitation. Four pounds of resistance were attached at the wrist. Jobe (6) reported that the supraspinatus is best isolated and exercised with the shoulder externally rotated. Tullos and King (8) described the mechanics of throwing in 1973. This description has been expanded more recently by McLeod (7). The throwing act consists of the following phases: windup (performed to get the body in position to unleash the kinetic chain), cocking (from the breaking of the hands in the windup to the fullest amount of external rotation of the arm), acceleration (from full external rotation to ball release), release arc (where the ball is released), deceleration (short, 40 millisecond act of slowing the arm down), and follow-through (positioning of the body at the end of the complete deceleration).

It is during the acceleration and deceleration phases that injury is likely to occur. Violent forces are generated during these stages (7). Acceleration injuries usually involve the anterior structures of the shoulder. The deceleration phase, with its even more radical force changes, usually causes injuries to the rotator cuff and the biceps tendon complex (3). Jobe et al. (4,5) analyzed the throwing act with EMG and found that the muscles of the rotator cuff were extremely active during the deceleration phase of throwing.

Understanding the mechanics of throwing, which muscles are active when throwing, and whether they are in an eccentric or concentric mode will aid the development of an exercise program designed to strengthen the rotator cuff. After examining research by McLeod (7) and Jobe et al. (6), we decided to evaluate exercises in various positions, in order to develop a more efficient rotator-cuff exercise program.

METHODOLOGY

Twenty-eight subjects with no history of shoulder injury or athletic participation (other than recreational baseball or softball) were studied. The group included 10 females and 18 males between 18 and 53 years of age.

The exercises selected for testing were those commonly given for rehabilitation of shoulder injuries. Four pounds of resistance were attached at the wrist. Jobe (6) reported that the supraspinatus is best isolated and exercised with the subject standing, lifting the arm into abduction, horizontally abducted 30°, and fully internally rotated. This position was used, as well as 0° horizontal adduction and 45° horizontal adduction in a standing position. The humerus was positioned not only in full internal rotation, but neutral and full external rotation.

With the subject prone, the arm was actively horizontally abducted with the humerus at 90° and 100° of abduction. The arm was lifted with the humerus in full internal rotation, neutral rotation, at 90° of external rotation, and at full external rotation (120°-140°).

Next, the glenohumeral joint was actively moved into extension in a prone position through the same four positions from internal to full external rotation. The next exercise was also done with the subject prone. With the arm abducted 90° and the elbow flexed 90°, the humerus was actively externally rotated to its fullest amount.

The next position was side lying. The affected arm was held at the side with the elbow flexed to 90°. From this position, the subject moved his arm from internal to external rotation.

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Fine-wire intramuscular electrodes were used to measure the electromyographic signals according to the methods described by Basmajian (2). The electrodes were made from insulated .02mm conductive wire. Insulation was removed from the electrodes, leaving about 2mm of bare wire. Two wires were inserted into a 1 or 1.5 inch 23-gauge hypodermic needle with the bare ends staggered so that they would not come in contact when introduced into the muscle. They were then bent back to lie against the needle. The assembly was sterilized by gas autoclaving.

The Basmajian-type electrodes were placed in each of the three rotator cuff muscles studied - the supraspinatus, infraspinatus, and teres minor. Much care was taken to insure that they were in the approximate center of the muscle belly. Each subject underwent kinesiological testing to insure placement of the electrodes.

After insertion, the other ends of the electrodes were attached into an electronic amplifier, allowing raw EMG data to be displayed on a 4-channel oscilloscope.

The EMG signal was fed to a fixed amplifier with a gain of 1,000 and a band pass from 50 Hz to 500 Hz. The signal was then converted from analog to digital records, sampled at the rate of 1 kHz and stored on the disk of a microcomputer. The data was sampled over a period of .5 seconds and stored to be integrated later. This time period was selected randomly during the sample time which was approximately 2 seconds in each test when the arm was perpendicular to gravity.

Since determining the maximum EMG value for each test was highly unreliable because of the fatigue factor of 23 tests, each muscle EMG value was normalized in relation to the maximum amount of EMG activity produced by that muscle across the test series. This means that it is not really possible to study the absolute behavior of one muscle in relation to the other. But this technique is an excellent means of allowing the analysis of one's muscle behavior across the series of tests. Since the goal was to find the best exercises for the posterior rotator cuff, this was an appropriate protocol.

These normalized EMG values were then averaged across the subject population to determine the statistical parameters of the EMG production in each test.

The student T Test was used to test the null hypothesis that the means of two independent groups are equal, based on two samples of equal size. The test statistic employs the pool estimate of the common variance with N-2 of freedom. Employing the sample size available to us (approximately 30 per group) and using a one-sided test of significance with a power of 80 percent, the minimum mean difference we could have expected to detect was approximately .6. The relationship we used in determining power, sample size, and minimum difference was as follows:

\[ N = \frac{a^2 \times 4 (z_1 - z_0)^2}{x^2} \]

\[ x = \text{the desired difference to be detected.} \]

RESULTS

The EMG records obtained from all tests are shown separately for each muscle in Figures 1, 2, and 3 and together in Figure 4. On the y-axis of each figure is the average value of the normalized EMG across all subjects. On the x-axis is the test number. Appendix A describes the tests. The order of presentation in each figure groups the tests so that the progression from internal rotation to external rotation is shown sequentially for each testing position. Tests 1 through 9 represent the results produced with the subject standing. Tests 10 through 22 were done with the subject lying prone and Test 23 with the subject side lying.

Figure 1, results of testing of the supraspinatus, shows a
trend towards an increased output as the tests progress from standing to prone; however, the only statistically significant difference between the values measured standing and prone is in Test 12 (Figure 5) \((t(50)>2.0, p<.05)\).

Figure 2 shows the results of testing of the infraspinatus. Both test series 10 through 13 and 14 through 17 show increased EMG values as the arm progresses towards full external rotation. These tests were done with the subject lying prone and appear to produce EMG values greater than those with the tests performed standing (Tests 1-9). Test 12 (Figure 5) and 16 (Figure 6) are the only tests of these eight that demonstrated statistically significantly greater output. Test 22 (Figure 7) also showed a statistically significantly greater output than Tests 1 through 9 \((t(53)>2.0, p<.05)\).

Figure 3 presents the results of testing of the teres minor muscle. This data appears similar to the data for the infraspinatus with the exception that the increase in output between standing Tests (1-9) and the prone Tests (10-17 and 22) were more dramatic. Statistically significantly greater amplitudes were demonstrated by Tests 11, 12, 15, 16, 20, and 22 \((t(53)>2.0, p<.05)\).

DISCUSSION

The data indicated that the supraspinatus muscle was involved whenever the arm was elevated whether the subject was standing or lying prone. Although there was an apparent increase in supraspinatus function during the test series 10-13, the only statistically significant value was achieved in the position of maximum external rotation, Test 12 (Figure 5). Relative isolation of supraspinatus function appeared to be demonstrated by pure abduction in neutral rotation of the arm while standing. Both the infraspinatus and the teres minor generally acted in concert. As demonstrated in both series 10-13 and 14-17, they were both external rotators. As the arm is externally rotated, their output increased dramatically and almost linearly. This indicated that in the prone position, having the humerus externally rotated as much as possible when performing the exercises, the best stimulation of the posterior rotator cuff muscles can be accomplished.

Test 22 (Figure 7) was performed with the subject prone, the elbow flexed and the humerus externally rotated. The output from the infraspinatus and the teres minor were similar to that for Tests 12 and 16. This was predictable, since Test 22 was in external rotation and Tests 12 and 16 (Figures 5 and 6) both have the humerus in external rotation.

An interesting result was the apparent isolation of the teres minor output in Test 20 (Figure 8). The subject was prone with the arm in extension and maximum external rotation. The output was greater than in Tests 18, 19, and 21, as well as in any of the standing tests. This position would be excellent both for testing teres minor strength and selectively rehabilitating the teres minor.

Test 23 represented a test of the ability of the posterior rotator cuff muscles to purely rotate the humerus. The subjects were lying on their sides with the humerus resting against their side and the elbow flexed to 90°. The forearm was supported horizontally. The output from all three muscles tested was significantly less than that exhibited by Tests 11, 12, 15, 16, and 22. With the humerus positioned in 0° along the length of the body, the line of action of the posterior cuff muscles is at a right angle to the humerus, a direction which directly rotates the humerus externally. When the arm is elevated to 90°, the rotator cuff must function not only as an external rotator but as a stabilizer. Therefore, the four pounds of resistance used in Test 23 did not stimulate the posterior rotator cuff in this mechanically advantageous position. Since one tries to design an exercise program that is specific to the activity the athlete must return to, the ultimate goal of the exercise program is to elevate the arm at least 90° of abduction where the throwing activity takes place.

CONCLUSIONS

1. When using hand or wrist weights, the prone position allows for increased activity of the posterior rotator cuff muscles than when standing.
2. Any exercise program using hand weights to strengthen the supraspinatus, infraspinatus, and teres minor muscles should include exercise positions similar to Tests 12 and 16 (Figures 5, 6).
3. Teres minor isolation can be accomplished using a prone body position with extension of the arm in external rotation (Test number 20, Figure 8).
4. The infraspinatus acts in concert with the supraspinatus or teres minor in most of the exercises tested.

APPENDIX A. EMG Study for Shoulder Rehabilitation

Experimental Protocol

Patient Standing

Test #1  Thumb pointed down 4 inches in front of pants seam (45°). Lift arm and hand to eye level - Pause 2 count - Lower.

Test #2  Thumb pointed down 2 inches in front of pants seam (30°). Lift arm and hand to eye level - Pause 2 count - Lower.

Test #3  Thumb pointed to midline. Lift arm in pure abduction to eye level - Pause 2 count - Lower.

Test #4  Thumb pointed forward. Lift arm in pure abduction to eye level - Pause 2 count - Lower.

Test #5  Thumb pointed forward. Lift arm in abduction 2 inches in front of pants seam (30°) to eye level - Pause 2 count - Lower.

Test #6  Thumb pointed forward. Lift arm into abduction 4 inches in front of pants seam (45°) eye level - Pause 2 count - Lower.

Test #7  Thumb pointed up. Lift arm into abduction 4 inches in front of pants seam (45°) eye level - Pause 2 count - Lower.

Test #8  Thumb pointed up. Lift arm into abduction 2 inches in front seam (30°) to eye level - Pause 2 count - Lower.

Test #9  Thumb pointed up. Lift arm into abduction 2 inches in front of pants seam (30°) to eye level - Pause 2 count - Lower.

Figure 5. In the prone position with the arm hanging from the table, the subject lifts the arm into horizontal abduction at 100° and extreme external rotation.

Figure 6. In the prone position with the arm hanging from the table, the subject lifts the arm into horizontal abduction at 90° and extreme external rotation.

Figure 7. In the prone position with the humerus supported at 90° and the elbow flexed to 90°, the subject externally rotates the arm.

Figure 8. In the prone position with the arm hanging from the table, the subject extends the arm with external rotation at the shoulder.
Patient Prone (Arm hanging off table)

Test #10 Thumb pointed down. Lift arm into HPA (horizontal prone abduction) with hand at eye level (100°) - Pause 2 count - Lower.
Test #11 Thumb pointed toward head. Lift arm into HPA with hand at eye level (100°) - Pause 2 count - Lower.
Test #12 Thumb pointed up. Lift arm into HPA (100°) to eye level - Pause 2 count - Lower.
Test #13 Thumb pointed toward feet. Lift arm into HPA (100°) to eye level - Pause 2 count - Lower.
Test #14 Thumb pointed down. Lift arm into HPA (90°) - Pause 2 count - Lower.
Test #15 Thumb pointed toward head. Lift arm into HPA (90°) - Pause 2 count - Lower.
Test #16 Thumb pointed up. Lift arm into HPA (90°) - Pause 2 count - Lower.
Test #17 Thumb pointed toward feet. Lift arm into HPA (90°) - Pause 2 count - Lower.
Test #18 Thumb pointed down. Lift arm into complete extension - Pause 2 count - Lower.
Test #19 Thumb pointed toward head. Lift arm into complete extension - Pause 2 count - Lower.
Test #20 Thumb pointed up as much as possible. Lift arm into complete extension - Pause 2 count - Lower.
Test #21 Thumb pointed toward feet. Lift arm into complete extension - Pause 2 count - Lower.

Patient Prone (Upper arm supported - forearm hanging off)

Test #22 Humerus at 90°, elbow flexed to 90°. Rotate humerus - Bring hand as high as possible - Pause 2 count - Lower.

Patient Side-Lying

Test #23 Elbow flexed to 90° - Humerus rests on midline. Rotate humerus into fullest external rotation - Pause 2 count - Lower.

REFERENCES

Guide to Contributors
(Revised December 1989)

Athletic Training, The Journal of the National Athletic Trainers' Association (NATA), 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 (athletic injury prevention, evaluation, management, and rehabilitation; administration of athletic training facilities and programs; and counseling and educating athletes concerning health care). Manuscripts should conform to the following:

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12. Titles should be brief and within descriptive limits (a 16 word maximum is recommended). The name of the disability treated should be included in the title if it is the relevant factor; if the technique or type of treatment used is the principle reason for the report, this should be in the title. Often both should appear.

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14. A comprehensive abstract of 75 to 200 words must accompany all manuscripts. Tips From the Field number the page one, type the complete title (but not the author's name(s)) on the top, skip two lines and begin the abstract. It should be a single paragraph and succinctly summarize the major intent of the manuscript, the major points of the body, and the authors summary and/or conclusions. It is unacceptable to state in the abstract words to the effect of "the significance of the information is discussed in the article." Also, do not confuse the abstract with the introduction.

15. Begin the text of the manuscript with an introductory paragraph or two in which the purpose or hypothesis of the article is clearly presented and stated. Highlight of the most prominent work of others as related to the subject at hand is often appropriate for the introduction, but a detailed review of the literature should be reserved for the discussion section. An overview of the manuscript is part of the abstract - not the introduction.

16. The body or main part of the manuscript varies according to the type of article (examples follow). Regardless of the type of article, however, the body should include a discussion section in which the importance of the material presented is discussed and related to other pertinent literature. Use of headings and subheadings, charts, graphs and figures is recommended.
   a. The body of an experimental report consists of a methodology section, a presentation of the results, and a discussion of the results. The methodology section should contain sufficient detail concerning the methods, procedures, and apparatus employed that others can reproduce the results. The results should be summarized using descriptive and inferential statistics and a few well planned and carefully constructed illustrations.
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   c. The body of a Case Study should include the following components: personal data (age, sex, race, marital status, and occupation when relevant — but not name), chief complaint, history of present complaint (including symptoms), resulting or physical examination (example: "Physical findings relevant to the rehabilitation program were..."), medical history (surgery, laboratory, exam, etc.), diagnosis, treatment and clinical course (rehabilitation until after return to competition, criteria for return to competition, and deviation from the expected [what makes this case unique]).
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   c. Abstract (first numbered page)
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Tips for Scientific/Medical Writers

Kenneth L. Knight, Editor

Following is a list of comments that I find myself repeating over and over to authors. We (the editors) offer them to you here in the interest of preventative medicine and motivation. We hope that you who do write will study these tips and apply them to your writing. By doing so you will both improve the quality of your manuscripts and decrease the time and effort required by you and us in getting the manuscript published.

To those of you who have much to say, but are not sure how to say it, we hope these suggestions will help you know how to write and thereby give you the courage to do so.

GENERAL HINTS

1. The best “how-to” manual on writing I’ve seen is DAY RA: How to Write and Publish a Scientific Paper. 3rd Ed. Phoenix: Oryx Press, 1988. This should be required reading for every writer. Time spent reading this will be repaid in time saved in writing and revising your manuscript.

2. Tips concerning construction of an article (i.e., what goes where) are contained in the Guide to Contributors that is published in each issue of Athletic Training, (last updated in December 1989), and in Knight KL: Writing articles for the journal. Athletic Training 13: 196-198, 1978. Read and use them to guide your manuscript preparation.

3. The word “data” refers to many numbers, and is therefore plural. Use adjectives such as “these” and “those” with data, not “this” or “that”.

4. Researchers don’t “find”, “discover” or “prove” things, they “observe” and “report” them.

5. Methods used by others to study problems such as yours should be reviewed and referenced in your paper. Reference the methods of others as well as reliability and validity information in the methods section. The pros and cons of various methods and why you chose one over another should be discussed and referenced in the discussion section.

6. Statistics don’t indicate or prove anything. Statistics provide you with support for making a decision. When you are reviewing literature you make a statement and reference others to support you. Use an analogous approach when reporting results, make a statement and then reference that statement with your statistical results.

7. The emphasis of a discussion should not be on other researchers, i.e., who did the research, but rather what they reported and how it relates to your work. For example, “The greater use of... by athletes in my study agrees with others ( ) who reported... but disagrees with those ( ) who...”

8. The purpose of a discussion must be to indicate to the reader how your results compare to the rest of the world. Don’t represent the results, but discuss them.

9. Every article should include suggestions to athletic trainers concerning how they might use the information presented.

10. Subheadings should be used liberally. Main or first level headers should be placed flush left, typed in all capitals, and not underlined. If the information under a header needs to be subdivided into two or more sections, use second-level or sub-headers. These should be flush left, underlined, and with the first letter of each word capitalized. If third level headers are needed to further subdivide information, they should be identical to a second level header except they are indented and part of the paragraph. The first sentence of the paragraph begins on the same line and immediately after the header. Both first and second level headers should have triple spacing before and double spacing after them.

GRAMMAR

11. Write directly. State the conclusion, then reference it. If the conclusion needs amplification, do it following statement of the main idea. Note: The advice refers to presenting results (where your reference is your statistical test - see Number 26 below) as well as when discussing others’ results and writings.

12. Paragraph: Should contain only one major idea, presented in the first sentence of the paragraph. All other sentences in the paragraph develop and amplify the central idea. Also, paragraphs with a single sentence are to be avoided.

13. Voice: Use the active voice. Only verbs have voice. A verb with a direct object is in the active voice. The direct object is converted into a subject, the verb is in the passive voice (see the sentences below). A passive verb is always a verb phrase consisting of a form of the verb be followed by a past participle. The subject of a passive verb does not act.

ACTIVE VOICE: PASSIVE VOICE
Priscilla chose John. John was chosen by Priscilla.
Ed must learn that. That must be learned.

14. Person: Use first person when telling what you did, second person when describing how to perform a technique, and third person to explain what others did. Person is the form of a verb or a pronoun which indicates whether a person is speaking (first person), is spoken to (second person), or is spoken about (third person).

First Person: I see the boy. We recommend this technique.
Second Person: Can you see the boy? Apply two strips vertically.
Third Person: He sees the boy. Each subject lifted 100 lbs.

15. Tense: Use past tense when referring to events of the past, present tense when giving instruction, and future tense when referring to events yet to occur. Tense is the form of the verb which indicates its relation to time.
Going the extra yard!

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Inflection (eat, eats, eating, ate, eaten) and the use of auxiliaries (will eat, have eaten, had eaten, will have eaten, etc.) show the tense of the verb.

16. **Number**: Sentences and paragraphs must be internally consistent concerning number. Number is the inflectional form of a noun, a pronoun, a demonstrative adjective, or a verb, and can be either singular or plural.

**SINGULAR** - book, man, I, this, that

**PLURAL** - books, men, we, these, those

**CONCERNING REFERENCES**

17. All statements and ideas of others must be referenced. If the author(s) is(are) not mentioned by name, the reference should be placed after the phrase or first mention of the idea.

18. Anytime you mention another author by name he/she must be referenced immediately after his/her name. (ex: “Jones(21) reported . . . four.”, not “Jones reported . . . four(21).”)

19. When referring to work by multiple authors and you need to use the authors' names, do so as follows: if two authors, use both names (ex: “Smith and Jones(21)” or “Smith & Jones(21)”); if there are three or more authors, use the name of the first author and “et al.”, which means “and others” (ex: “Black et al. (5) reported . . .”).

20. When the reference is at the end of a sentence, it should be placed before the period. (i.e., “body(23).” not “body.(23)”)

21. It is often appropriate, especially in an introduction or discussion, to refer to ideas or results from numerous authors in the same sentence. The following illustrates how to do so. “Most people prefer red apples (6,9,21,33), but some prefer yellow (6,10,21) or green (6,9,24,30) ones.”

**Note**: All three of the ideas in this sentence were mentioned by reference #6, and two of the three ideas were mentioned by reference #21.

22. Always refer to research and writing of others in the past tense (“Jones believed” not “Jones believes”; “Smith reported” not “Smith reports”). Maybe that person has changed his mind since the article was written.

**REPORTING NUMBERS**

23. Numbers of a single digit (1-9) should be written alphabetically (i.e., “nine” not “9”). Numbers of multiple digits (i.e., 2.3 or 10 and greater) are written in numerical form unless they occur at the beginning of a sentence, in which case they are written alphabetically.

24. Report numbers to the same precision or one more decimal place than what you measured. For example, if you measured torque in whole numbers, you report “113.5 newtons” not “113.45 newtons”. If you measured to the nearest 10 pounds you can report to the nearest pound, not to the nearest 1/10 of a pound. Precision of the instrument dictates the precision you report.

25. The symbol “p”, when used to refer to the level of probability, is written in the lower case.

26. When indicating the level of significance or probability, use only two numbers if the first is not a zero (i.e., .36 not .364). If the first number is a zero, continue reporting numbers until the first non zero (i.e., .0002 not .00 or .00023).

27. When reporting the results of a statistical test, state the conclusion reached, and then in parenthesis, report the test used (t or F), the degrees of freedom in parenthesis after the test symbol, the results of the test, and the level of significance. For example: Football players had higher test anxiety scores than basketball players did \( t(15)=4.62, p<.01 \); or \( F(3,25)=3.62, p=.003 \). This format gives the most important information from the test and eliminates the need for a statistical table.

**CONSTRUCTING TABLES**

28. Tables must be complete. That is, a reader must be able to understand the information in the table without referring to the text.

29. Tables must not be redundant of text. Put your information either in the text or a table, not both. You must refer people to the table, and sometimes it may be appropriate to point out the highlights in the table so as to stimulate interest. But do not ramble on in the text concerning information that is already in the table.

30. Don’t put information in a table that can more easily be presented in the text. For instance, ht, wt, and age of subjects is often necessary, but should be placed in the text rather than in a separate table as illustrated in the following sentence. “Ten male volunteers \( age=21.3\pm2.1\ yr, \ ht=67.3\pm4.2\ in, \ wt=183.4\pm10.3\ Ib. \) were the subjects for this study.”

31. Tables should not contain vertical lines and only three full length horizontal lines (one between the title and header descriptions, one between the column headers and the first line of data, and one following the last line of data). Smaller horizontal lines may be used in the header to separate a general heading from sub-headings under it, or in columns of data to indicate a break between a column of numbers and a total or average of that column of numbers. See example below.

**Table 1**

Example of a Table (with units of measurement)*

<table>
<thead>
<tr>
<th>Header 1</th>
<th>Header 2</th>
<th>Header 3</th>
<th>Header 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub 2a</td>
<td>Sub 2b</td>
<td>Sub 2c</td>
<td>Sub 3a</td>
</tr>
<tr>
<td>Row 1</td>
<td>Info</td>
<td>Info</td>
<td>Info</td>
</tr>
<tr>
<td>Row 2</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>Row 3</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

| Total    | Info     | Info     | Info     | Info     | Info     |

*See item 5 concerning units of measure.

32. Identify the units of measurement of the tabled data in the most general way possible. If all data in the table have the same unit of measurement, that unit should be in parenthesis following the table title. If the columns or
33. When a table contains data that have been averaged, report the SD (or SE) in parenthesis after the mean [ex. 24.6(3.7)]. Remember to use the proper precision (see #24 above).

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38 YEARS OF EXPERIENCE
Medial tibial stress syndrome (shin splints) is a common problem in athletics (4). It is primarily an overuse injury that may result in: 1) myositis, 2) tendonitis, 3) micro trauma to the periosteum, or 4) stress fracture. One cause is muscular fatigue, which results in an inability of the muscles to act as an adequate shock absorber (2,7). A second contributing factor is abnormal foot pronation, a common biomechanical problem in lower leg injuries (3,5,6).

Following is a description of a taping technique for medial tibial stress syndrome that provides support to the medial structures of the lower leg. A modified Gibney strapping (1) is used to support the structures on the lateral side of the ankle to limit inversion. This technique reverses the pull of the gibney stirrups so that the structures on the medial side of the ankle are supported. With limited eversion and calcaneal valgus, less stress is incurred by the injured musculature. This allows healing and repair to take place while the athlete is participating.

The features of this taping technique are: 1) the stirrups are applied with a lateral to medial pull to limit eversion and calcaneal valgus, 2) the heel locks support the medial longitudinal arch, and 3) the anchors may also provide compression which may be useful in minimizing injury to the periosteum.

PROCEDURE

1) Prepare the ankle with tape adherent, pre-wrap (if desired) and heel & lace pads (if desired). Position the foot in neutral or in slight inversion, so that the tape stretches as the foot approaches neutral, but not predisposing the athlete to an inversion sprain.

2) Apply two anchors four or five inches above the malleoli. Apply three or four stirrups lateral to medial, starting and ending on the anchors. The first stirrup covers the poster ½ of the malleoli, with each successive stirrup applied anterior to, and overlapping ½ the width of the previous stirrup. The stirrups are then anchored.

3) Begin a figure-of-eight on the lateral malleolus (Figure 1). Pull the tape under the arch, up and across the anterior aspect of the talo-cural joint (Figure 2); encircle the distal aspect of the tibia and fibula (Figure 3); crisscross the tape and end at the lateral malleolus.

4) Begin a medial heel lock lateral to the anterior midline of the most superior anchor. Pull the tape diagonally down across the tibia and continue posteriorly over the medial malleolus and cross the Achilles tendon (Figure 4). Continue the tape over the lateral aspect of the calcaneus under the arch (Figure 5), and up and across the anterior aspect of the tibia and fibula, ending just inferior to the start of the heel.

Joseph D. Grant is an athletic trainer/physical therapist at Charles River Sports Therapy West in Wellesley, Massachusetts 02181.
lock (Figure 6). A lateral heel lock is then applied in the same manner as the medial heel lock, but in the opposite direction.

5) Repeat step 4.

REFERENCES

The Use of Percutaneous Pinning and a Silicone Splint for a Fractured Proximal Phalanx

Thomas J. Dewey, MD
James B. Gallaspy, ATC

ABSTRACT: Fractures of the phalanges are among the most common fractures in sports, with the proximal phalanx being the more commonly fractured. These fractures present special problems for the physician and athletic trainer because they are frequently associated with serious tendon injuries and could limit range of motion. Several operative procedures are available to stabilize the fracture, but the percutaneous pinning procedure allows the athlete to begin early rehabilitation procedures to maintain range of motion in the proximal interphalangeal joint. The use of a silicone splint allows the athlete to be able to participate at an earlier date.

Fractures of the phalanges are among the most common fractures in sports, with the proximal phalanx being more commonly fractured than the other two phalanges due to the fact that the entire leverage of the fingers is brought to bear on the proximal phalanx (6). Fractures of the proximal and middle phalanges are difficult to treat because of the frequent association of serious tendon and skin injuries as well as instability from lack of soft tissue support (4). These fractures should be referred to an orthopedist since involvement of the extensor and flexor tendons could limit motion of the finger (1). Further complications such as rotation or non-union can occur if the fracture is not immobilized adequately.

The diagnosis of proximal phalanx fractures may be arrived at clinically from the presence of swelling, tenderness, and percussion tenderness. Fingernail alignment should be checked to determine whether rotation or angulation has occurred due to the injury (8).

If the fracture cannot be stabilized or reduced to near anatomical position, percutaneous pinning or open reduction and internal fixation is recommended (2,4,6). The percutaneous pinning technique allows for early motion and prevents adhesions that develop with open reduction, when the extensor mechanism must be split and the periosteum reflected (4). If internal fixation has provided satisfactory fracture stabilization, the athlete should begin early active exercise, within pain tolerance, to avoid proximal interphalangeal (PIP) stiffness (2,4,6).

PRESENTATION OF CASE

The subject of the study was an 18-year-old male, varsity basketball player, who injured the index finger on his left hand playing a pick-up game of basketball three weeks prior to the first regular-season basketball game. X-rays revealed that he had sustained a closed comminuted fracture of the proximal phalanx of the left index finger on his non-shooting hand (Figure 1). The orthopaedic surgeon decided that surgery was needed for the best results. A percutaneous pinning with three K wires of a closed fracture was determined to be the most effective procedure for returning the athlete to competition. K wire, named for Dr. Martin Kirschner, is a steel wire placed through a long bone in order to apply traction to the bone (9).

Operative Procedure

The patient was given an intravenous regional anesthetic. When satisfactorily anesthetized, the left hand was prepped with Betadine and draped. A surgical C-arm fluoroscopy unit, (an X-ray tube and fluoroscopic image intensifier mounted on opposite ends of a C-shape movable gantry) was utilized to ensure reduction after the proximal phalanx fracture of the index finger was manipulated to a satisfactory position (5). When the position was satisfactory, three K wires were inserted transversely across the fracture site. The C-arm fluoroscopy unit was utilized to ensure satisfactory positioning of these pins. When the fracture was considered stable, reduced, and satisfactorily fixed internally (Figure 1), the pins were cut off beneath the skin. Then a soft dressing was applied to the finger with the metacarpophalangeal joint flexed at approximately 70 degrees. This tightens the metacarpophalangeal joint, which helps prevent contracture of the ligaments and relaxes the intrinsic muscles that flex the proximal phalanx (2).

Post Operative Care

Seven days after surgery the splint was removed and the
athlete began active twice-a-day range of motion exercises, within pain tolerance to prevent stiffness. The goal of the treatment program was to gain optimal proximal interphalangeal joint motion. Manual support was given at the level of the fracture while encouraging active proximal interphalangeal flexion and extension. A silicone splint (Figure 2) covering the entire finger was placed on the athlete two weeks after surgery and he was allowed to begin dribbling, passing, and shooting drills. The procedure for making the splint was described by DePalma (3). It consisted of layers of gauze and silicone cement applied alternately until satisfactory protection was achieved. The finger was buddy taped to the middle finger each day for athletic participation, and for normal daily activities. This permitted the finger to be held in a fixed position without strain and provided some stability for angular and rotatory positioning (7). Three weeks after surgery the splint was cut below the distal phalanx to allow for better control of the ball and shooting (Figure 3).

He played twenty-seven minutes in the opening basketball game of the season, three weeks after the injury. The silicone splint provided excellent protection, while allowing for good ball control, and did not hinder his shooting ability.

Not all finger fractures can be managed with this procedure, but this injury did respond well to the percutaneous pinning treatment, followed by an active therapy program and protective splinting. Using the percutaneous pinning procedure and the silicone splint this athlete was able to participate sooner than if an open reduction had been done.

REFERENCES
NEW McDAVID COWBOY COLLAR CUTS STINGER, SHOULDER INJURIES AT OSU

A recent study at Oklahoma State University indicates that a new piece of protective football equipment—the McDavid Cowboy Collar—is remarkably effective in helping reduce stinger and shoulder injuries.

Essentially an advanced neck roll system and a padded vest in one, the McDavid Cowboy Collar can offer better protection with less restriction under the helmet than traditional neck rolls.

Totally new in concept and design, the Cowboy Collar is worn as regular equipment or as protection after an injury. It’s the only product that incorporates a molded collar of resilient, closed-cell, polyethylene foam with a padded, protective vest. The Cowboy Collar was developed jointly by Jeffrey D. Fair, Ed.D., ATC, Head Athletic Trainer at Oklahoma State University, and McDavid Sports Medical Products of Illinois.

The Cowboy Collar’s unique design absorbs shock by cupping the sides and back of a player’s helmet. This provides a cantilever effect by firmly supporting the helmet inside the collar, reducing the angle of flexion of the neck. The result is less restriction and better control of hyperextension and extreme lateral movement of the head.

Ultra-lightweight, yet durable, the Cowboy Collar simply spring loads into most standard shoulder pads and stays in place with minimal shifting. Its molded, one piece construction is almost totally non-restrictive, providing more freedom of movement. The Collar is available in sizes Regular (14½"-16½" neck) and Large (16½"-19" neck).

Protection Breakthrough

Through the 1989 football season, Cowboy Collar developer Jeff Fair conducted a study at Oklahoma State University to determine the Collar’s effectiveness.

Selected linebackers were required to wear the Cowboy Collar since OSU data indicated that linebackers were the most likely to sustain neck injuries.

At the study’s end, none of the linebackers fitted with a Cowboy Collar had suffered a brachial plexus injury, while twelve players at other positions had. After being fitted with Cowboy Collars, only three of these twelve players had mild recurrences of their injuries.

“Our data suggests that the Cowboy Collar is most effective when used as preventive equipment,” said Fair. “And that the Collar helps prevent further, more severe injury when worn after an initial injury.”

“None of the players fitted with a Cowboy Collar sustained a shoulder injury, either. And most players who wore the Collar liked it. “We found that the Collar was somewhat of a teaching aid,” Fair noted. “Players would bring their heads up until they felt the Collar’s support, to make sure they were properly positioned.”

“From our study, it appears that the Cowboy Collar is clearly a step in the right direction in reducing injuries in an injury-plagued sport,” concluded Fair.

For a free copy of the OSU Study, or for more information on the Cowboy Collar and a catalog covering the full line of McDavid Sports Medical Products, write McDavid at P.O. Box 9, Clarendon Hills, Illinois 60514 or call 800 237-8254. (In Illinois, call 312 626-7100.)
ABSTRACT: Anabolic steroids, synthesized male sex hormones, are developed for the clinical usage. However, they are used by athletes for the purpose of enhancing athletic performance these days. Recent studies show the use of anabolic steroids has spread among various levels of athletes. The users believe that this drug would produce more muscle mass; therefore, they can gain speed and power. Athletes get anabolic steroids primarily through the black market. They use steroids by several techniques, such as stacking and pyramiding. However, the anabolic effects of anabolic steroids in the human body have not yet been proven satisfactorily. On the other hand, the use of steroids causes severe health problems and creates the unfairness among athletes. To solve these problems, several approaches are being taken, such as discouraging the supply, drug education, and drug testing. However, the most important considerations for health professionals are to be familiar with the updated information and gain the trust of the athletes by good communication with them.

WHAT ARE ANABOLIC STEROIDS?
Anabolic steroids have synthetic chemical components (3). There are several kinds on the market (4) (Table 1). The structures of most are very similar to the natural male hormone, testosterone (3) (Table 2).

The Effects of Anabolic Steroids
Research has indicated that sex hormones might have a body building effect (5). Steroids have basically androgenic effects and anabolic effects. Androgenic effects promote growth development and maintenance of reproductive tissue in the male. On the other hand, anabolic effects cause nitrogen retention, protein synthesis in skeletal muscle, increased blood volume, and an increase in the number of red blood cells (5). Athletes usually use steroids for the anabolic effects (5).

Background
The use of anabolic steroids by athletes was first reported in 1954 and was widespread among those athletes who needed great strength to compete in both college and professional sports, even though anabolic steroids were originally developed for clinical usage by the patients who had synthetic illness or were underweight (5). The use of anabolic steroids has spread to various levels of athletes. Recently, anabolic steroids have also been used by bodybuilders and high school students who use them to enhance their physical appearances (7).

How Do Athletes Get Anabolic Steroids?
Athletes usually get anabolic steroids through several sources. These consist of black market, mail order, and health care professionals, including physicians, pharma-
cists, and veterinarians, etc. (7,8). Among these sources, the black market is the primary source; athletes spend more than $100 million a year on anabolic steroids (8) (Table 3).

The secondary source is probably the health care professionals. In fact, it is not uncommon that the physician prescribes anabolic steroids for athletes who need to enhance their athletic performance (8). According to Richard Strauss, MD, associate professor of preventive medicine at Ohio State College of Medicine in Columbus, 41% of the steroid users received the drugs from physicians (9).

How Do Athletes Use Anabolic Steroids?
Anabolic steroids can be administered either by injection or pill form (5). According to some studies, the injection appears to be safer than the pill due to detrimental effects to the liver caused by the pill. In addition, injected into the body, anabolic steroids stay in the body system longer (10).

Athletes use anabolic steroids by several techniques. One is called “stacking”, which is the oral administration of different steroids or the combination of pill and injection of steroids. Another way to use anabolic steroids is “pyramiding”. This is the taking of steroids in a cycle: a low amount is taken at the beginning of a cycle and an increase of the dosage follows until one peak. After peaking, the dosage gradually decreases towards to the end of cycle. The length of a cycle varies (5,11).

The dosage which an athlete self-administers is varied and depends on the individual. Athletes usually take as much as 40-100 times more than the therapeutic dosage which is based on the natural testosterone level.

Do Anabolic Steroids Really Work?
Tommy Chaikin, a former South Carolina lineman, said about his experience of anabolic steroids use, “People who say steroids do not work don’t know what they are talking about. You’ve got to experience what I mean. Your muscles swell . . .” (13). Many users believe anabolic steroids increase muscle mass and help their athletic performance. Do anabolic steroids really work? Both athletes and health care professionals want to know the facts.

Anabolic steroids are believed to increase body weight and muscle size. Because of them, the athletes gain the speed and power they need for competitions. In fact, the effectiveness of anabolic steroids in producing more protein at the ribosome of the cell is proven scientifically. A study of certain animals proves that anabolic steroids work in producing skeletal muscles because of this effect (14). However, in human research, very few studies are satisfactory because of the following problems:

1. Because the athletes are worried about side effects, the researchers usually use a small sample. As a result, they can not get random studies.
2. In a double blind study, researchers usually fail to maintain the blind stage of the subjects because the subjects show aggressiveness from the side effects of anabolic steroid use.
3. The problems with using a placebo is that it is very difficult to determine how long anabolic steroids remain active in the subject body after withdrawal.
4. In many research studies a lower dosage of steroids is used than the amount most athletes are using.
5. No study has been done on multiple anabolic steroid use which is believed to be the way many athletes are using the drug (14).

Many scientists conclude that anabolic steroids “may” increase lean muscle mass and increase strength and endurance. However, there is no satisfied conclusive scientific evidence with proves anabolic steroids aid athletic performance. We can not ignore the psychological effect mentioned by some scientists. Due to the effects of anabolic steroids on the central nervous system, the user experiences less fatigue. As a result, they can work out longer than before, and gain muscle mass (15,16).

The Side Effects of Using Anabolic Steroids
Whether they take advantage of either the anabolic steroids assumed chemical effects or the psychological effects, sooner or later athletes will experience the side effects warned of by many physicians and scientists (4) (Table 4).

ANABOLIC STEROID USE

The use of anabolic steroids in Olympics was reported in 1954. After the Tokyo Olympics in 1964, the anabolic steroid use among Olympians became common. The International Olympic Committee (IOC) reacted to anabolic steroids usage among the athletes to protect the spirit of the Olympics and the Commonwealth. In 1974, the IOC banned the use of anabolic steroids and began urine testing in 1976 (3,4). At the Montreal Olympics, eight of 275 athletes tested positive. Ten positive results were reported at the Seoul Olympics in Korea (3). In 1988, the week before Ben Johnson tested positive, the IOC approved the international chapter on controlling drug use. “The use of drugs, other substances, and banned methods to enhance or accentuate athletic performance is a tragic reality that must be eliminated from modern sports.”(17)

Professional Sports
In the National Football League (NFL) testing for steroids began in 1988. According to the results of the tests, 6% of the NFL players were using anabolic steroids (17). In addition, when the NFL tested their prospective draftees for anabolic steroids at tryout camp, 20 out of 330 players tested positive (18).

College
In college sports, anabolic steroids are also used. The National Collegiate Athletic Association (NCAA) surveyed the steroid use among college athletes in 1985 and it showed that 4% of college athletes use anabolic steroids. Ron Heiziner, a drug-abuse consultant, said “four percent is not a big figure” and that the real problem is that the use is growing and the age of the users is getting younger (18).

High School
A recent study conducted in 46 private and public high schools across the nation showed that 6.6% of 12th grade male students used or had used anabolic steroids and more than two-thirds of them began the usage when they were 16 years old or younger. In other words, anabolic steroid use is not only at the high school levels, but in the junior high schools, too (7).
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THE CURRENT PROBLEMS

Even though the number of steroid users in these studies is not big, many people believe that more people are using steroids. Dr. Frederic Hagerman who is an Ohio University Professor of Zoology, and has worked as a coordinator of the drug problem in past Olympics, made a comment about steroid use at the Olympic Games. “Considering that thousands of athletes participate in the Olympics, you can look at it two ways. Either there are few drugs being used or athletes are better at manipulating them. I think the latter is probably the case.” (19). Also one NFL team's general manager said about the positive test result at the tryout camp, “The players who get caught are either very stupid or so heavily into it they cannot get off.” (19). The reason why some anabolic steroids users do not test positive is because it is possible to clean the body system by quitting steroid use three to six weeks before the steroid screening and the competitions (20). According to Robert C. Voy, MD, when the US Olympic Committee began anabolic steroid screening without sanction, about 50% of the athletes tested positive (17). This problem may be getting bigger and deeper.

SOLUTION

J.E. Wright said in Exercise and Sport Sciences Review, “ Regardless of one’s perspective, facing us is a serious problem which demands interest and attention, both philosophical and scientific.” (10). The role of health care professionals in sports medicine is to protect the health of athletes and maintain the ethic of competition. How can we solve this problem? How are we approaching the solution of this problem? What should we do for this problem?

Discouraging Physicians to Supply Anabolic Steroids to Athletes

In the US, the physician who prescribes steroids for an athlete is not rare. These physicians usually prescribe steroids to steer athletes clear of steroid black markets and believe that they can protect athletes from the risk by supervising. Recently, Tony Miller, a well known Australian sports medicine physician, admits supplying anabolic steroids to athletes who want them for enhancing athletic performance (21). However, Robert B. Kees, MD, recently stopped prescribing steroids to athletes and did so because he discovered that his athletes went to the black market for more steroids and they were actually using more steroids than he had prescribed (22).

Reclassification of Anabolic Steroid as a Controlled Substance

William N. Taylor, MD, thinks that anabolic steroids should be reclassified as a controlled substance. This

<table>
<thead>
<tr>
<th>Table 1. Anabolic Steroids</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generic Name</strong></td>
</tr>
<tr>
<td>Bolasteron</td>
</tr>
<tr>
<td>Boldenone</td>
</tr>
<tr>
<td>Clostebol</td>
</tr>
<tr>
<td>Dehydrochlormethyl Testosterone</td>
</tr>
<tr>
<td>Fluoxymesterone</td>
</tr>
<tr>
<td>Ultandren</td>
</tr>
<tr>
<td>Mesterolone</td>
</tr>
<tr>
<td>Metandienone</td>
</tr>
<tr>
<td>Metenolone</td>
</tr>
<tr>
<td>Methandrostenolone</td>
</tr>
<tr>
<td>Methytestosterone</td>
</tr>
<tr>
<td>Oriton, Testred</td>
</tr>
<tr>
<td>Nandrolone</td>
</tr>
<tr>
<td>Nandrobolic</td>
</tr>
<tr>
<td>Norethandrolone</td>
</tr>
<tr>
<td>Oxandrolone</td>
</tr>
<tr>
<td>Oxymesterone</td>
</tr>
<tr>
<td>Oxymestholone</td>
</tr>
<tr>
<td>Stanozolol</td>
</tr>
<tr>
<td>Testosterone</td>
</tr>
<tr>
<td>Related Compounds</td>
</tr>
</tbody>
</table>


| Table 2. Molecular Structure of Testosterone and Anabolic Steroid |

reclassification would limit the illegal diversion of steroids to the black market (11). He also said this reclassification is very important when we think about steroid use by youngsters, who are encouraged by easy availability (23). Another good aspect of his idea is we can identify which physicians are prescribing steroids for athletes by legal observation (23).

Drug Education Program

The implementation of preventive drug education programs is necessary. Many athletes are getting misinformation about anabolic steroids on the street that is not even close to being accurate. Athletes should be educated for their own health. Preventative education should be considered and should contain the following list according to Engs and Fors (24):
1. Build up self-esteem
2. Decision-making
3. Assertion skills
4. Stress reduction
5. Recreational activities
6. Factual information

The University of Alabama's drug education program has mandatory attendance at drug awareness/education courses and additional lectures for preventative drug education. Further education includes counseling and a rehabilitation program for positive-tested athletes (25). A. Dean Picket said "Effective education must rely on practical, accurate, factual information with less emphasis on values clarification and situational ethics." (26).

Drug Testing and Counseling/Rehabilitation

Drug education is a very important component of the program. However, drug education by itself is not good enough. Robert C. Voy said "Drug education is great, but we have found that we need a tool for the educational process." (3). That is drug testing.

Drug testing is the best way to restrict steroid use and provide fair competition. The combination of drug testing with drug education is most effective for a drug program. Anabolic steroid use can be detected by radioimmunoassay screening (3). The technique is getting more sophisticated and more accurate every year. However, the expense is still a problem. Accurate testing costs up to $200 per test (18). Small school and competitions may not be able to afford to use it widely.

Also, there is another problem in drug testing even if it is cheap and accurate. With all the expensive and sophisticated testing, steroid use may be hard to detect if athletes become more sophisticated in the use pattern as previously mentioned (18). Therefore, many people point out the necessity of the random screening during the training period throughout a year (10,17). Robert C. Voy strongly recommends random testing during the training period and said "If this can't be done, then I feel that drug testing has very little value in controlling drug use." (17).

However, we should not depend on drug testing to solve the problem. Andrew Pipe, MD, Chairman of the National Advisory Committee on Drug Abuse in Amateur Sport, Sports Medicine Council of Canada, warns that relying on drug testing in sports is "like relying on the breathalyser to solve the problem of drinking and driving" (17). Now when steroids are detected, what should we do?

A drug education program should operate not only with drug testing, but should also include counseling, rehabilitation, and sanction for detected athletes (27).

In addition to these elements, institutions which are leading to develop programs and their policies should refer to a lawyer during the early stages (26,28).

Trust Between Athletes and Health Care Professionals

In order to solve the problem related to the use of anabolic steroids among athletes, people need to make an effort. Those who are dealing with this problem need to be

Table 3. Examples of synthetic anabolic-androgenic steroids seized by police in the apartment of a black market distributor in Florida

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Trademark</th>
<th>Quantity Seized</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nandrolone decanoate</td>
<td>Deca-Durabolin</td>
<td>3053 2-ml vials (100 mg/ml)</td>
<td>$13/vial</td>
</tr>
<tr>
<td>Testosterone cypionate</td>
<td>Depo-Testosterone</td>
<td>246 10-ml vials (200 mg/ml)</td>
<td>$13/vial</td>
</tr>
<tr>
<td>Testosterone enanthate</td>
<td>Delasteryl</td>
<td>10710-ml vials (200 mg/ml)</td>
<td>$15/vial</td>
</tr>
<tr>
<td>Testosterone propionate</td>
<td>Oreton</td>
<td>84 10-ml vials (100 mg/ml)</td>
<td>$11/vial</td>
</tr>
<tr>
<td>Boldenone undecylenate (veterinary)</td>
<td>Equipose</td>
<td>74 50-ml vials (50 mg/ml)</td>
<td>$10.5/vial</td>
</tr>
<tr>
<td>Stanozolol (veterinary)</td>
<td>Winstrol-V</td>
<td>22 30-ml vials (50 mg/ml)</td>
<td>$110/vial</td>
</tr>
<tr>
<td>Nandrolone phenpropionate</td>
<td>Durabolin</td>
<td>389 2-ml vials (50 mg/ml)</td>
<td>$12/vial</td>
</tr>
<tr>
<td>Bolasterone (veterinary)</td>
<td>Finaject 30</td>
<td>10 50-ml vials (30 mg/ml)</td>
<td>$105/vial</td>
</tr>
<tr>
<td>Methenolone enanthate (not approved in US)</td>
<td>Primobolan Depot</td>
<td>347 1-ml vials (100 mg/ml)</td>
<td>$12/vial</td>
</tr>
<tr>
<td>Methandrostenonone</td>
<td>Dianabol</td>
<td>2,344 bottles of 11.5-mg tablets</td>
<td>$17/bottle</td>
</tr>
<tr>
<td>Methyltestosterone</td>
<td>Oreton Methyl</td>
<td>195 bottles of 100 10-mg tablets</td>
<td>$14/bottle</td>
</tr>
<tr>
<td>Stanozolol</td>
<td>Winstrol</td>
<td>47 bottles of 100 2-mg tablets</td>
<td>$26/bottle</td>
</tr>
<tr>
<td>Oxandrolone</td>
<td>Anavar</td>
<td>31 bottles of 100 2.5-mg tablets</td>
<td>$26/bottle</td>
</tr>
<tr>
<td>Fluoxymesterone</td>
<td>Halotestin</td>
<td>28 bottles of 100 10-mg tablets</td>
<td>$45/bottle</td>
</tr>
<tr>
<td>Oxymetholone</td>
<td>Anadrol-50</td>
<td>12 bottles of 100 50-mg tablets</td>
<td>$70/bottle</td>
</tr>
<tr>
<td>Methenolone</td>
<td>Primobolan</td>
<td>37 bottles of 30 50-mg tablets</td>
<td>$46/bottle</td>
</tr>
<tr>
<td>Ethylestrenol</td>
<td>Maxibolin</td>
<td>200 bottles of 100 2-mg tablets</td>
<td>$25/bottle</td>
</tr>
</tbody>
</table>

*From court records. Prices based on distributor's price list to customers.

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A decade ago, we told athletes that anabolic steroids didn’t work, that they didn’t improve strength and athletic performance. Our athletes saw through the lies, and we have lost their trust.

What we need now to solve this problem is to show the facts of steroids so that athletes will go back the way it should be. We have to be clear about the consequences of using anabolic steroids by showing the list of the side effects. We must educate our athletes and the public about the dangers of anabolic steroids.

**Table 4. Side effects of steroid use**

<table>
<thead>
<tr>
<th>Adult Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Acne</td>
</tr>
<tr>
<td>2. Increase in aggressiveness and sexual appetite - sometimes resulting</td>
</tr>
<tr>
<td>in aberrant sexual and criminal behavior, but after repeated use leads to</td>
</tr>
<tr>
<td>impotence.</td>
</tr>
<tr>
<td>3. Kidney dysfunction</td>
</tr>
<tr>
<td>4. Reduction of testicular size (testicular atrophy)</td>
</tr>
<tr>
<td>5. Reduction of sperm production (cessation of spermatogenesis)</td>
</tr>
<tr>
<td>6. Breast enlargement</td>
</tr>
<tr>
<td>7. Premature baldness</td>
</tr>
<tr>
<td>8. Enlargement of the prostate gland</td>
</tr>
<tr>
<td>9. Prostatitis (inflamed prostate gland)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adolescents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Severe facial and body acne</td>
</tr>
<tr>
<td>2. Premature closure of the growth center of long bones which may result</td>
</tr>
<tr>
<td>in stunted growth</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Masculinization</td>
</tr>
<tr>
<td>2. Abnormal menstrual cycles (suppression of ovarian function</td>
</tr>
<tr>
<td>and menstruation)</td>
</tr>
<tr>
<td>3. Excessive hair growth on the face and body*</td>
</tr>
<tr>
<td>4. Enlargement of the clitoris*</td>
</tr>
<tr>
<td>5. Deepening of the voice*</td>
</tr>
</tbody>
</table>

*MAY CAUSE PERMANENT EFFECTS.


aware of steroids and know the accurate, factual, and latest information all the time. We, as health care professionals, have to be trusted by athletes. Paul Thompson, MD, a cardiologist at The Mirian Hospital in Providence, Rhode Island, said “A decade ago, we told athletes that anabolic steroids didn’t work, that they didn’t improve strength and performance but the athletes could see we were wrong. Now we are trying to scare them with tales of health risks.” (20).

What we should not do is try to convince athletes to give up using anabolic steroids by showing the list of the side effects. What we need now to solve this problem is to show the facts and gain the athletes’ trust which we have lost. We have to sit together face to face and talk about truth (20). If we can do it, we may solve the problem of anabolic steroid use among athletes and sports will go back the way it should be, like everybody is hoping.

**ACKNOWLEDGEMENT**

This paper is dedicated especially to Chad Starkey, Sheila Schrach, and those who make me think of Ohio as a special place. Also, special thanks to Shelley Wharton, LaJune Pandy, and Dave Kern for their assistance in the preparation of this paper.

**REFERENCES**

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EATA NEWS

At the EATA meeting at Kutsher's Lodge in January, the EATA presented the National Headquarters in Dallas with a flagpole and flag in appreciation and support of the National Athletic Trainers' Association, Inc. The arrangements for installation will be handled through the National Headquarters and the EATA Executive Counsel. This gift was presented to President Mark Smaha during his visit to the meeting.

1989 Indiana Athletic Trainer of the Year Award Winners

(left to right) Ralph Reiff, winner in College/University division, of Butler University, Indianapolis; James Routhier, winner in High School division, of Concord High School, Elkhart; John Coddington, winner in Clinical/Professional division, of Baxter Physical Care, LaPorte.

DISTRICT NEWS

District 9

The Executive Committee members of the Athletic Trainers Association of Florida for the period June 1989-91 are:

Kent Knisley ......................... President
Tony Sutton .......................... Vice-President
Lisa Kelleher ........................ Secretary-Treasurer
Randy Oravitz ...................... Regional Rep. - Panhandle
Benny Vaughn ...................... Regional Rep. - North Central
Jeff O'Neil ......................... Regional Rep. - Central
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Mike Voight ......................... Regional Rep. - South

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June 9-13, 1990
Indianapolis Convention Center, Indianapolis, Indiana

Tentative Program
1990 National Clinical Symposium and Workshop
National Athletic Trainers Association, Inc.
Indianapolis Convention Center
June 9-13, 1990

Saturday, June 9
NACDA Seminar - Drug and Alcohol Seminar
Evening - Gatorade Welcome Party

Sunday, June 10
A.M.
Session I: AOSSM Seminar - Knee Injuries
Session II: PFATS Workshop - Performance Enhancement

P.M.
SCHERING SYMPOSIUM: EATING DISORDERS
EVENING
Session I: SCHERING SYMPOSIUM: EATING DISORDERS
Session II: Women's Conference

Monday, June 11
A.M. - 3 Concurrent Sessions
Session I:
7:00 a.m. — 8:00 a.m. — 10 Mini Sessions - See Registration
8:30 a.m. — 9:00 a.m. — Welcome and Opening Remarks
9:00 a.m. — 9:30 a.m. — Keynote Address - Milton Thompson, J.D.
“The Amateur Sports Movement”
9:30 a.m. — 10:00 a.m. — “Psychology of the Athletic Trainer - Learning
More About Ourselves”
10:00 a.m. — 10:30 a.m. — “Counseling the Athlete”
11:00 a.m. — 1:00 p.m. — National Business Meeting

Session II:
9:30 a.m. — 11:00 a.m. — Poster Presentations

Session III:
9:00 a.m. — 10:00 a.m. — Licensure Committee “Town Meeting”
10:00 a.m. — 10:30 a.m. — Orthotics in the Training Room
P.M. - 5 Concurrent Sessions - 2:00 P.M. - 4:30 P.M.

Session I:
Conditioning/Performance Training
— Training of the High School Multi Sport Athlete
— Running Development of the College Athlete
— Strength Development of the Professional Athlete
— Developing Speed and Quickness

Session II:
Manual Therapy - An Overview
— Concepts of Joint Mobilization
— PNF - Theory and Clinical Application
— Deep Friction Massage
— Soft Tissue and Myofascial Techniques

Session III:
2:00 p.m. — 3:00 p.m. — Student Trainer Workshop

Session IV:
2:00 p.m. — 3:00 p.m. — Gatorade Seminar
3:30 p.m. — 4:00 p.m. — NCAA Report - Randy Dick
4:00 p.m. — 4:30 p.m. — Follow-Up Study on Paper Presented by Dr.
Donald Cooper 20 Years Ago

Session V:
4:30 p.m. — 6:00 p.m. — Seminar on Research Techniques
— District Meetings

Tuesday, June 12
A.M. - 5 Concurrent Sessions
Session I:
7:00 a.m. — 7:45 a.m. — 10 Mini Sessions as Per Monday
See Registration
8:00 a.m. — 8:30 a.m. — Keynote Address - Coach Bobby Knight
“A Perspective of Athletics in the 1990s”
8:30 a.m. — 12:00 p.m. — Closed Kinetic Chain/Biomechanics
— Clinical Biomechanics

Session II:
8:30 a.m. — 12:00 p.m. — Shoulder
— Global Instability of the Shoulder
— Labrum Tears and Instability of the Shoulder
— Shoulder Impingement Syndrome
— Rotator Cuff Dysfunction
— Rehabilitating Shoulder Problems

Session III:
8:30 a.m. — 12:00 p.m. — High School Athletic Trainers Workshop
Session IV:
8:30 a.m. — 10:30 a.m. — Dental Injuries in Athletics
11:00 a.m. — 12:00 p.m. — Free Communications

Session V:
8:30 a.m. — 12:00 p.m. — The Establishment of a Solid Insurance
Program At Your School
— Nutrition - How To Feed A Wrestler

P.M. - 4 Concurrent Sessions - 2:00 P.M.-5:00 P.M.

Session I:
Isokinetics
— Isokinetic Equipment & Its Application to Rehabilitation
— Clinical Application of Isokinetics
— Isokinetic Research
— Issues and Answers in Isokinetics

Session II:
Overuse Syndromes
— Biomechanics of the Foot and Ankle
— Lower Leg Compartment Syndrome
— Ankle/foot Overuse Problems
— Herniated Lumbar Disc - Surgical Management
— Back Pain - The Organic Approach
— Muscular Imbalances

Session III:
Clinical/Industrial Athletic Trainers Seminar
Session IV:
Free Communications

Evening - Annual Awards Banquet

Wednesday, June 13
Session I:
8:15 a.m. — 9:15 a.m. — Sports Vision: A Guideline for Screening and Training
9:15 a.m. — 10:00 a.m. — Sexually Transmitted Diseases
10:00 a.m. — 10:30 a.m. — Erythropoietin - Use and Misuse
10:30 a.m. — 11:00 a.m. — Endocrinological Concerns of the Competitive Athlete

Session II:
8:15 a.m. — 9:00 a.m. — ACLs - Researching Repairs and Rehabilitation
— Meniscal Repairs and Transplants
— ACLs and the Female Athlete
— Knee Injuries - A Road to Total Joint Replacement
— New Orleans - “1991” - Dean Kleinschmidt

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For information and a scholarship application, please contact:

William E. Prentice, PhD, ATC, LPT
Director, Sports Medicine Education
HEALTHSOUTH Rehabilitation Corporation
214 Fetzer CB #8700
University of North Carolina
Chapel Hill, NC 27599-8700

Dates Set For NATA District and National Meetings In '90

| National Meeting: | June 9-13, 1990  
| Convention Center in the Hoosier Dome 317/262-8100  
| Westin Hotel Indianapolis, IN 317/262-8100 | Tim Kerin (615/974-1229) |

| NATA Contact: | | | |

| District 1 & 2 | January 7-9, 1990  
| Kutsher’s Lodge Monticello, NY 800/431-1273 (outside New York) or 914/794-6000 in New York | Matthew Gerken (508/697-1252) |

| NATA Contact: | | | |

| District 3 | May 18-20, 1990  
| Cavalier Hotel Virginia Beach, VA 804/425-8555 | Robbie Lester (919/733-3512) |

| NATA Contact: | | | |

| District 4 | March 8-10, 1990  
| SeaGate Centre — 419/255-3300  
| Radisson Hotel Toledo Toledo, OH 419/241-3000 | George Young (817/565-2662) |

| NATA Contact: | | | |

| District 5 | March 16-18, 1990  
| Nebraska Center for Continuing Education University of Nebraska at Lincoln 402/472-3435 | Jerry Weber (402/472/2276) |

| NATA Contact: | | | |

| District 6 | July 26-28, 1990  
| Arlington Convention Center— 817/459-5000  
| Sheraton Centre Park Hotel Arlington, TX 817/261-8200 | Rich Griswold (303/247-7576) |

| NATA Contact: | | | |

| District 7 | March 16-18, 1990  
| Hyatt Regency Tech Center Denver, CO 303/779-1234 | Jerry Robertson (615/929-4208) |

| NATA Contact: | | | |

| District 8 | June 22-24, 1990  
| Anaheim Marriott Anaheim, CA 714/750-8000 | Bill Chambers (714/879-5227) |

| NATA Contact: | | | |

| District 9 | July 9-11, 1990  
| Columbus Iron Works Convention and Trade Center— 404/327-4522  
| Columbus Hilton Columbus, GA 404/324-1800 | Tom Koto (208/336-8250) |

| NATA Contact: | | | |

| District 10 | March 23-25, 1990  
| Red Lion Inn Riverside, ID (near Boise) 208/343-1871 | |
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Book Review

Phil Callicutt, EdD, ATC

Winter Sports Medicine
Editors: Murray J. Casey, MD, Carl Foster, PhD, Edward G. Hixson, MD
F.A. Davis Company/Publishers
1915 Arch Street
Philadelphia, PA 19103
1989
425 pages: 134 Illustrations
Price: $65.00

Winter Sports Medicine is the most technical sports medicine publication I have attempted to review in my four years as book reviewer for The Journal of The National Athletic Trainers Association. This text is written with the physician in mind. I do not feel that many athletic trainers will have the desire to purchase this book at the price of $65.00, unless he or she has a strong interest in winter sports such as skiing, skating, climbing, or winter camping.

Now, if you have made the decision that you have a strong interest in the above mentioned winter sports and want to become better versed in the prevention and treatment of the many conditions associated with these specialized activities, you will enjoy reading and studying this book. It is divided in forty-five well written chapters dealing with a wide range of subjects: Skin Problems in Winter Sports, Cold Injuries and Hypothermia, Exercise-Induced Bronchospasm in Winter Sports, Headache in Winter Sports, The Physiology of Speed Skating, Overuse Injuries in Figure Skating, Ice Hockey Injuries, Ski-Jumping Injuries, Hillside Evacuation, Medical Aspects of Bobsled and Luge, Medical Aspects of Mountaineering, and Nutrition for High Altitudes.

 Specialists in every aspect of winter sports tell you how to help athletes build and maintain skills. You will find training regimens for all winter sports and activities. The authors of the guide share what they have learned helping our finest athletes win Olympic medals. Everything from what to pack in your black bag to what to check for in physical exams. This book was written for a very limited readership, but it is interesting and well written. If you do decide to purchase and read it, I assure you that you will come away with a new respect for those physicians who deal in winter sports medicine. But as stated at the start of this review, it is not a book for everyone. ©
A Doctor's Prescription for the Pitcher
Center for Sports Conditioning, Inc.
223 Commonwealth Ave.
Boston, MA 02116
49 minutes (2 tapes, 19min/30min)
Macrovision-copy protected
¼” VHS color, Instructional Aids
Price: $49.95

Baseball Strengthening and Conditioning
PROformance Athletic Training Consultants
Peter Shmock, Producer/Co-owner, PROformance
60 minutes
¼” VHS color
Price: n/a *

With the beginning of the new year many athletic trainers have changed gears from football bowl games to basketball season and finally, looming on the horizon, the start of baseball season. Be that as it may, it is inevitable that a few pitchers will develop some kind of a throwing related injury. While it is impossible for the athletic trainer to stop these injuries from occurring, he/she may be able to decrease the incidence or the severity, provided the pitcher has adhered to a specific conditioning program. This conditioning program should contain elements of strength, aerobic exercise and flexibility. The following two video programs, A Doctor’s Prescription for the Pitcher and Baseball Strengthening and Conditioning are comprised of all these elements. However, there is some disagreement between Dr. Papas and Mr. Shmock as to the use of weight training equipment and the amount of weight used in strengthening the pitching shoulder.

A Doctor’s Prescription for the Pitcher is developed by Dr. Arthur Papas, Orthopedic Surgeon and Medical Director for the Boston Red Sox. Dr. Papas enlists the help of Mr. Rich Zawacki, P.T., in the development of this video. A Doctor’s Prescription is a two (2) tape series with easy to follow instructions for both strength and flexibility exercises. Dr. Papas introduces the use of the Thera-band as an aid to strengthening the shoulder girdle. The Thera-band is used in selected exercises about the shoulder which are demonstrated during the video.

The first tape is a general explanation of the importance of the pitcher and the need for the pitcher to be on a year-round conditioning program. Dr. Papas emphasizes the importance of the year-round program to decrease the chance of injury and to increase performance. Dr. Papas incorporates the help of Dennis Eckersley, pitcher for the Oakland Athletics baseball club, as an endorsement for A Doctor’s Prescription. Eckersley was plagued with shoulder problems throughout his career, but these problems were decreased after beginning Dr. Papas’s program.

The second tape illustrates the actual exercises that comprise Dr. Papas’s workout program. Dennis Eckersley serves as the model for demonstration in the flexibility, strength and aerobic conditioning exercises. At this point Dr. Papas emphasizes that the use of the Thera-band, wrist cuff weight and dumb bell weights are the basis for his
continued on page 77
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HEMATOLOGY/ONCOLOGY
Iron Deficiencies

There has been much speculation on the theory that iron supplements will improve an athlete's performance. Many athletes take iron supplements with the expectation that having higher levels of blood iron will improve their performance as well as out of concern that their length and intensity of training will make them iron deficient. The athletes who most commonly take iron supplements are triathletes, ultraendurance triathletes, and elite runners.

Iron status of these endurance athletes has been the subject of much debate and research. Researchers have been spending a lot of time undermining the earlier mentioned theories why athletes take supplements. In one study, plasma ferritin levels in a group of swimmers, runners, and triathletes, ages 13 to 61 were compared. George Selby, MD, a professor of medicine at the University of Oklahoma, stated from the findings, "I don't think athleticism per se lowers iron stores. Athletes often appear to have low iron stores because their aerobic training causes an expansion of plasma ferritin readings. Other factors apart from exertion may predispose some athletes to low iron stores. These include blood donations, multiple pregnancies, a history of gastrointestinal bleeding, use of monosteroidal anti-inflammatories, and an austere diet." (1). Selby also added that athletes are no more likely than nonathletes to be iron deficient and they show the same age-related increase in iron stores (1).

At the University of South Carolina, researchers took blood samples from 51 female aerobic dancers and 87 sedentary women of comparable age, weight, height and tested for hemoglobin, hematocrit, serum iron, percent saturation of transferrin, and serum ferritin. No significant differences in group means were found. Lisa Klingshirn, a graduate student in the Department of Exercise Sciences stated, "Women from our study showed they're not at a high risk of deficiency later on into the season. In females the risk of deficiency later on into the season. In females the risk of deficiency later on into the season. The question for athletes is whether a mild iron deficiency in the runner, 72 runners and non-runners were tested over a 75 day running period. 34% of the females and 8% of the males developed nonanemic iron deficiency. A primary cause of the deficiency was a low initial iron store.

Low stores at the beginning of training can increase the risk of deficiency later on into the season. In females the deficiency can be increased due to menstruation. Initial stores can also be related to an inadequate diet. An iron-rich diet may not prevent inadequate iron stores among athletes, possibly because of the decreased absorption associated with strenuous exercise and an iron-deficient state. James Nickerson, MD, pediatrician at the Marshfield Clinic in Wisconsin, states, "What we recommend is that a ferritin level be done at the start of the season, and, if the results are low, the athlete take iron supplements for three months. That will suffice for 80% of the athletes. Supplementation throughout the entire year is not necessary if iron stores are adequate after three months." (4).

Fifty ultraendurance athletes competing in the 1988 Ironman Triathlon in Hawaii were examined using several hematologic indexes. These athletes are a unique group, combining long intense training periods for more than one sport. Although running is a regular part of their training, they usually run shorter distances than the long-distance runners. The iron status of triathletes was previously reported to be adequate (5). In this study almost 50% were reported to have serum iron and transferrin saturation levels indicative of latent iron deficiency (6).

For athletes who train strenuously, the accuracy of iron status assessment has been questioned, in part because of the confounding effects of inflammation (6). The purpose of the study done on the athletes in the ironman competition was to assess the iron status of ultraendurance triathletes using several common hematologic indexes and to examine the interrelationships among these indexes.

Each one of the athletes completed a questionnaire and a 3-day food record. Of 50 participants, 31 were men and 19 were women. Food records were analyzed for total calories and iron intake, including iron supplementation. Blood was drawn from the athletes three days before the race and analyzed for complete blood cell count, hemoglobin, hematocrit, serum ferritin, and percent saturation. Based on the study of the athletes, the following was concluded: 1) Iron status is generally good in ultraendurance triathletes; 2) Caution should be used in assessing iron status, since approximately 25% may have unusual response patterns in the iron indexes; 3) Although triathletes probably have expanded plasma volumes, mean hemoglobin is similar to that seen in other endurance athletes. The marked difference in the incidence of dilutional anemia between male and female triathletes suggests that 12 gm/dl may be too low a cutoff value for women; 4) Triathletes appear to have adequate intakes of iron because of good diet selection and the common practice of taking iron supplements (7).

In another study on the frequency of anemia and iron deficiency in the runner, 72 runners and non-runners were
assessed on the impact of iron supplementation. Parameters were taken on the runners taking and not taking supplement and those non-runners doing the same. This study concludes that anemia is not a statistically common event in the runner. Likewise, iron depletion is not more frequent in the runner when compared with the non-runner. These data would then suggest that any evidence of anemia or iron depletion in the runner cannot be ascribed purely to the activity and must be approached as an independent clinical incident (8).

In conclusion, the studies reviewed showed that there are athletes who are indeed iron deficient. But, the evidence states that the reasons for the deficiency must be clearly studied and that the percentage of athletes who are deficient is very low. Iron status should be tested early in the athletes' training and competitive season and a supplementation given to those who need it. Iron deficiency is greatly reduced if the athletes will take good care of themselves, especially in their diets, and supplementation is not always needed.

BIBLIOGRAPHY


VIDEO REVIEW, from page 73

strengthening routine. It is Dr. Papas’s feeling that a significant increase in muscle mass can be detrimental to the pitcher and the throwing motion. Hence the advocacy of light weights (1 to 5 pounds) for these exercises.

The second tape in this series is by far the best of the two tapes. It provides clear instruction to all the exercises prescribed by Dr. Papas. I especially like the complete workout routine provided at the end of the program. It helps to take the boredom and monotony out of exercising by yourself. However, to get to this portion of the tape you must either watch the beginning instruction or fast forward the tape to the start of the workout program. Initially, it would be good to watch the instruction portion repeatedly. This would refresh the user’s memory as to proper technique and form, but after a while this has the potential to become a hassle for the viewer.

Baseball Strengthening and Conditioning takes an opposing view to that of A Doctor’s Prescription with regard to strengthening the pitcher’s shoulder. Mr. Peter Shmock, author of this tape, is an advocate in utilizing a free weight strength program to increase the pitcher’s shoulder strength. Like Dr. Papas, Mr. Shmock also feels that flexibility and aerobic conditioning play a major role in the improvement of the pitcher’s overall performance.

Baseball Strengthening and Conditioning takes a step by step instructional approach in the free weight routine that Shmock outlines as important in developing the pitcher’s shoulder strength. The tape also demonstrates the flexibility and aerobic conditioning exercises that Peter Shmock feels are important to the pitcher. Shmock is also a proponent of rubber tubing exercise. Shmock demonstrates these exercises and explains how they are of benefit to the throwing motion. A dumbbell or wrist cuff weight program in the pitcher’s shoulder program is also utilized. Shmock uses this program in conjunction with the free weight exercises to enhance the pitcher’s strength.

In the last portion of Baseball Strengthening and Conditioning, Peter Shmock outlines a suggested workout program and the necessary criteria for progression. Likewise, Shmock provides a similar kind of outline and schedule of aerobic exercise for the pitcher.

I was impressed with Baseball Strengthening and Conditioning. I found the description of exercises and the advice of Mr. Peter Shmock to be sound. My only reservation with this video is the length of viewing. It is too long and I found myself not as focused at the end of the video as I was in the beginning. The pitcher is hit with an overwhelming amount of information. This may be too much for the younger viewer to comprehend all at once.

A Doctor’s Prescription for the Pitcher and Baseball Strengthening and Conditioning are two good video programs focusing on the pitcher and preventing potential problems pitchers may face secondary to the throwing motion. I found the information conveyed in both videos to be sound. The most interesting point, I thought, was the opposing views of Dr. Papas and Mr. Shmock in strengthening the pitching shoulder. It is for that reason that I chose to include both video tapes for review.

*REVIEWER’S NOTE: I would like to thank Mr. Robert Gray, Chairman of the NATA Audio-Visual Aids Committee, for the loan of this video tape.

Editor’s Note: To provide members with current orthopaedic knowledge in a time-effective and cost-efficient manner, the American Academy of Orthopaedic Surgeons has modified its videotape library program to include only those tapes from the most recent three years and to offer them at a substantially lower purchase price. The AAOS videotape program offers for purchase approximately 100 videotapes in the ½ inch VHS format. The three-year collection includes award winning tapes selected by the AAOS Committee on Audio-Visual Education and covers a wide variety of orthopaedic topics, from total knee arthroplasty to diagnosis of chondrogenic bone tumors.
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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, Ed.D., ATC, Head Athletic Trainer, Athletic Department, Oklahoma State University, Stillwater, OK 74078.

Refer to the following dates to ensure your event will appear in the desired issue.

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March

15-17 Fourth Annual Conference on Exercise Sciences and Sports Medicine, San Juan, PR. Contact Office of Continuing Education, Tufts University School of Medicine, 136 Harrison Avenue, Boston, MA 02111.

16-18 Mid-America Athletic Trainers Association District 5 Spring Symposium, Lincoln, NE. Contact Jerry Weber, Athletic Department, University of Nebraska, Lincoln, NE 68588.

17-24 12th Annual Vail Sports Medicine Conference, Vail, CO. Contact Rose Medical Center Conference Program, Beth Israel Foundation, 800 Clermont Street, Suite 300, Denver, CO 80220-3816.

April

6-8 Sports Medicine Essentials of the Knee, Meridien, CT. Contact Physical Therapy & Sports Medicine Associates, 29 North Main Street, West Hartford, CT 06107.

May

6-9 International Isokinetic Congress, Washington, DC. Contact International Isokinetic Congress, 505 King Street, Suite 154, LaCrosse, WI 54601.

16-20 National Fitness, Nutrition and Sports Exposition, Chicago, IL. Contact Walt Heithaus, 617/536-8152.

22-25 37th American College of Sports Medicine Annual Meeting, Salt Lake City, UT. Contact American College of Sports Medicine National Center, P.O. Box 1440, Indianapolis, IN 46206-1440.

27-31 The Sixteenth Annual Convention of the Association for Behavior Analysis, Nashville, TN. Contact ABA, Western Michigan University, 258 Wood Hall, Kalamazoo, MI 49008-5052.

June

9-13 NATA National Convention, Indianapolis, IN. Contact National Athletic Trainers’ Association, 2952 Stemmons, Suite 200, Dallas, TX 75247.

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Certification Examination Schedule for 1990

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

January 14, 1990 — Deadline for the receipt of application is December 8, 1989.

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Fort Worth, TX
Granville, OH
Kansas City, MO
Monclair, NJ
Mt. Pleasant, MI
Omaha, NE
Orlando, FL
Pittsburgh, PA
Santa Clara, CA

Anderson, IN
Boston, MA
Caldwell, NJ
Chicago, IL
Columbia, SC
Costa Mesa, CA
Denver, CO
Hershey, PA
Houston, TX
Kansas City, MO
Lexington, KY
Minneapolis, MN
New Britain, CT
Phoenix, AZ
Santa Clara, CA
Seattle, WA

May 20, 1990 — Deadline for the receipt of application is April 6, 1990.

Ann Arbor, MI
Boston, MA
Cherry, WA
Claymont, DE
Costa Mesa, CA
Dayton, OH
Denver, CO
Edinboro, PA
Ft. Worth, TX

July 8, 1990 — Deadline for the receipt of application is June 1, 1990.

Columbus, GA

November 18, 1990 — Deadline for the receipt of application is October 5, 1990.

Albuquerque, NM
Anderson, IN
Birmingham, AL
Bowling Green, OH
Madison, WI
Mechanicsburg, PA
New Britain, CT
Providence, RI
Seattle, WA

July 9, 1990 — Deadline for the receipt of application is June 1, 1990.

Columbus, GA
Journal

The Journal office gets its mailing labels from the National Headquarters. Labels for NATA members are produced from the membership roster as maintained and updated by the Membership Office. NATA members who do not receive a Journal should contact the Membership Office to check on their address of record. If an address change was made just prior to a Journal being mailed, it’s possible that the change did not get to the Membership Office in time to have a correct label produced. If the member did not authorize Second Class mail forwarding with the post office, then that issue was probably thrown away when received at the post office. After a member has checked with the Membership Office at National Headquarters and determined that the address change was not received in time for a correct label to be produced, hence an issue was missed, then the member can purchase the back issue from the Journal office as long as the supply lasts.

Journal Replacement Policy

The Policy for handling claims for missing Journals due to address change is based on the stipulation that the notice of change of address be received at National Headquarters at least 30 days prior to publication, in order for the member to receive a gratis replacement Journal. If the member did not meet the “30 day” requirement, or did not authorize the post office to forward Second Class mail, then the responsibility for not having received the Journal rests with the member and a minimum replacement charge is made. New members and Reinstated members do not receive back issues published before their membership was validated. New members will receive the first issue published after NATA membership is in effect. Reinstated members (previously deleted due to nonpayment of dues) will receive the first issue published after confirmation of reinstatement is issued from the Membership Office.

NATA members who do not receive their Journals should check with the Membership Office at the National Headquarters to determine if the membership roster reflects an incorrect address.

Audio-Visual Aids Committee

Sports Medicine Text Bibliography

This listing is provided to the membership of the National Athletic Trainers’ Association, Inc., as a service of the Audio-Visual Aids Committee. It was compiled by Scott Richter, ATC, Program Director of Athletic Training at the University of Montana.

ANATOMY AND PHYSIOLOGY


ATHLETIC AND SPORTS INJURIES


Kinesiology


Sports Medicine


SPORT PSYCHOLOGY


SPORT PSYCHOLOGY

Bell, Keith. Dr. Keith Bell on the Nuts and Bolts of Psychology for Swimmers. Austin, TX: Dr. Keith Bell. 1980.

SPORT SAFETY


THERAPY, REHABILITATION AND MODALITIES


WEIGHT TRAINING AND SPORT CONDITIONING


Volume 25 Number 1 — Spring 1990 • Athletic Training 85


SPORT LAW


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Human growth hormones may be to tomorrow’s athletes what steroids are to today’s, says Dr. Thomas M. Sodeman, Associate Dean of the Texas Tech Health Sciences Center School of Medicine. And unfortunately, athletes thinking of a potential competitive edge — though ignoring long-term health implications — may be too willing to use them.

“HGH is a relatively new substance, but it is already available on the street to athletes,” said Sodeman, a pathologist.

Like steroids, HGH can help increase size and strength. Unlike steroids, it cannot be detected in urine. While HGH has been used medically to counter dwarfism or stunted growth in children, its clinical use has been limited because of uncertainty about its long-term effects.

“Athletes who use HGH are literally performing uncontrolled experiments on themselves,” Sodeman says.

The emphasis society places on sports and the philosophy to win at all costs contributes to the willingness of athletes to use drugs for a competitive advantage, Sodeman said.

For instance, anabolic steroids can help athletes increase muscle mass and recover more quickly from injuries. However, the long-term drawbacks outweigh any short-term advantages.

“ Their effects are temporary and this represents the addictive aspect of steroid use. Steroids cause the body to accumulate fluid. As soon as an athlete stops taking the drugs, the fluid leaves the body. It’s a sham,” Sodeman says.

The effects of the substances can be an unhealthy sham because steroids, which are derived from the male hormone testosterone, can cause sex drive loss, erratic mood swings, liver damage and heart damage which can lead to cardiac arrest.

Current medical testing procedures using gas chromatography/mass spectrometry make it virtually impossible for steroid use to go undetected.

“Some athletes do try to cover the steroids,” Sodeman said, “but for all practical purposes the tests cannot be fooled. In effect, athletes who use them are damaging their health without achieving their motives.”

Much less is known about human growth hormones and its long-term effects. Detection by testing is impossible because it is a substance produced naturally by the body to stimulate growth. When the body’s regulation of HGH goes awry, dwarfism or gigantism can result. How supplemental usage of HGH could affect the body over the long term is just speculation because little research has been done in the area.

“What is often overlooked by athletes who improperly use these so-called ‘performance-enhancing drugs’ is that

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the span of their athletic career is very short, but they have to
live with the result for the rest of their lives,” Sodeman said.

**Comparison of Jogging, The Relaxation Response, and Group Interaction for Stress Reduction**

*Journal of Sport and Exercise Psychology*

Jogging and other relaxation techniques help some people reduce psychological stress. Little is known, however, about the benefits for people who do not personally select the particular activity, or about comparable effectiveness. We compared the stress reduction benefits of jogging, Benson’s relaxation response, group interaction, and a control group in a nonclinical population. College students (N-387) were randomly assigned to treatment. After completing the Profile of Mood States (POMS), a demographic inventory, and a measure of social desirability, students practiced a stress reduction activity of 12 weeks. They compared the POMS before and after group meetings of monthly intervals. Jogging and relaxation response helped students reduce short-term stress significantly more than did a group support (p<.04). Students in all three techniques reported significantly greater short-term reductions in stress than did the controls (p<.03). Given that there were no long-term benefits, participants need to practice their activities regularly if they want continued benefits.

**Supplements for Athletes?**

*Good Health Digest*

Half of all Americans say they exercise regularly. And a good many of them — from weekend walkers to triathlon participants — try to maximize performance by taking vitamin and mineral supplements.

A Washington, D.C. dietitian and exercise psycholgist says, “There is no evidence that taking a combination in excess of the Recommended Dietary Allowances (RDAs) will improve physical performance.” Maureen Smith's assertion is backed by researchers who have studied the effects of vitamin supplements on exercise over the past 50 years, reports Environmental Nutrition.

Trying to boost athletic performance with vitamin supplements does not work. What’s worse, excessive doses of Vitamins A and D can actually be harmful.

Of all the nutrients studied, the one most likely to be lacking in athletes — and non-athletes — is not a vitamin at all; it’s a mineral: iron. Unlike a vitamin deficiency, lack of iron, or anemia, can adversely affect athletic performance. And women are especially susceptible to an iron deficiency. Athletes and non-athletes alike are advised to increase iron consumption by consuming more of its food sources, including lean, red meats; iron-enriched breads and cereals; and foods cooked in cast iron skillets.

**Bibliography on Sports Medicine**

*AAOS Report*

The National Library of Medicine has prepared a bibliography on Physical Fitness and Sports Medicine. The 62-Page, 1406-item bibliography includes materials on the history and current perspectives of sports, sports medicine, and physical fitness; sports injuries; and physical fitness in the various stages of life. For a free copy of book, send a self-addressed gummed label to: The Editor, Specialized Bibliography Series, Reference Section, National Library of Medicine, Bethesda, MD 20894.

**Physical Education in Elementary Schools**

*The Nutrition Connection*

Physical education programs must become a critical part of the total school environment. A minimum of 30 minutes should be devoted to physical education on a daily basis. Programs should be evaluated in terms of their effectiveness in accomplishing the following goals:

1. Physical education programs should cultivate a positive attitude toward physical fitness. Teachers often push and cajole youngsters into fitness with little concern for the negative attitudes such actions may create. It is more effective in the long run to develop a positive feeling toward physical activity than a high fitness level. Fitness levels are transient, but attitudes can prevail for a lifetime. In practice, children should be encouraged to exercise regularly within their personal limits. The days of “calisthenics and running a mile” for all children regardless of ability and interest must end.

2. In addition to fitness, programs must concentrate on skill development. Too often, the skill development portion of physical education is sacrificed in order to increase the emphasis on fitness. Physical education programs must have a dual nature; that of fitness and skill development. Skills are the tools which most adults use to attain fitness. The large majority of individuals will maintain fitness through various skill-based activities such as tennis, badminton, swimming, golf, basketball, aerobics, bicycling, and the like. People have a much greater propensity to participate as an adult if they feel competent in the activity. School programs must leave students with basic skills in a wide variety of activities.

3. Finally, school programs must teach the knowledge base required for maintaining a healthy lifestyle. A clear understanding of health-related fitness and how it is maintained throughout a lifetime must be taught in concert with skills and fitness development. Students must learn how to evaluate personal fitness levels and rectify deficiencies. They must learn how to determine which activities enhance fitness and are personally motivating.

**AAOS Introduces New Texts, Videos, and Brochures**

*AAOS Report*

The Academy has introduced several new educational products including: two scientific texts, New Perspectives on Low Back Pain, and Instructional Course Lectures, vol. 38; three patient education videos on Arthroscopy, Hip Replacement, and two additions to the Academy's patient education brochure series, “Shoulder Pain” and “Neck Pain.” Call AAOS customer service, toll free, at 1-800-626-6726 for order information.
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