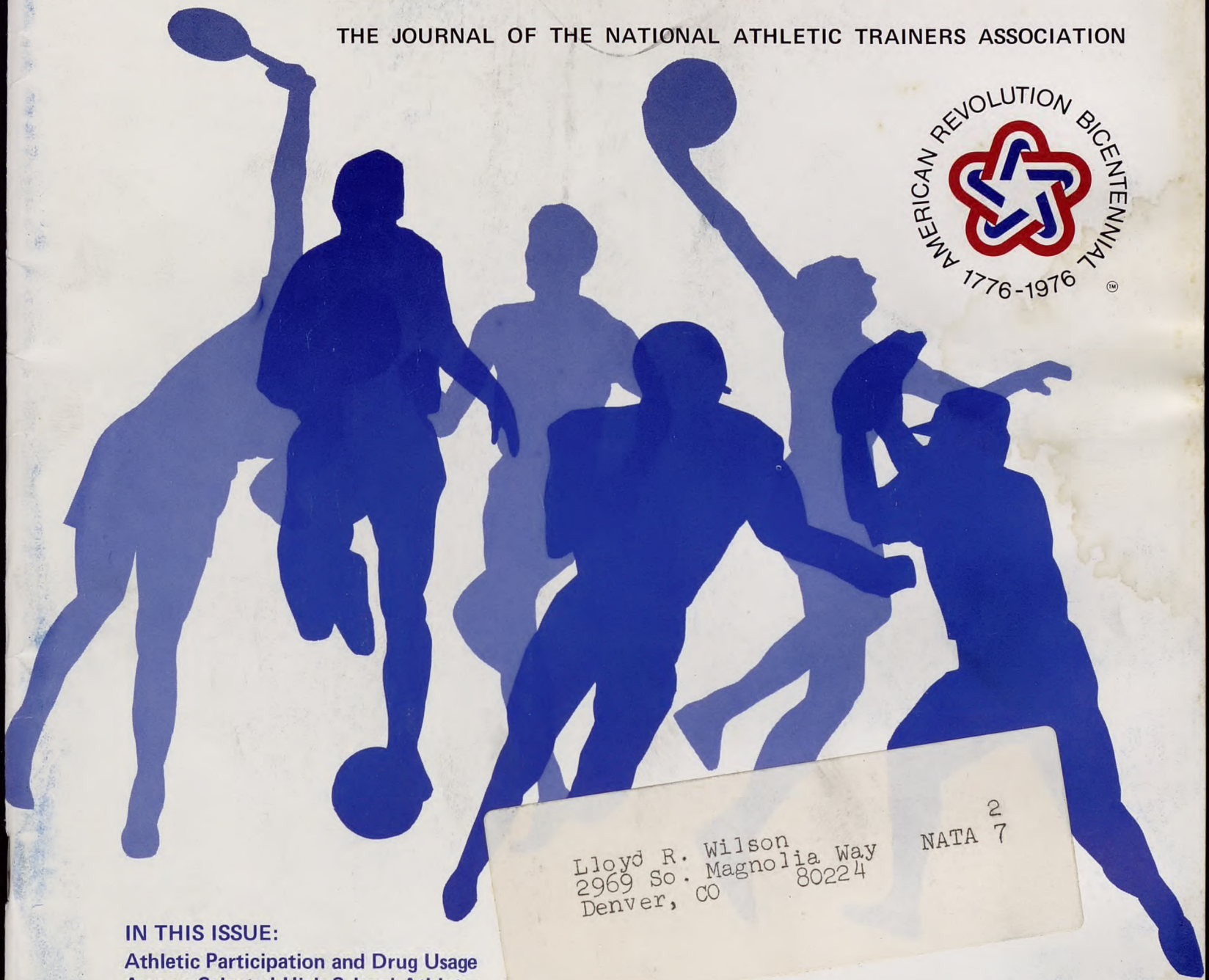
ATHLETIC TRAINING

THE JOURNAL OF THE NATIONAL ATHLETIC TRAINERS ASSOCIATION



IN THIS ISSUE:

Volume 11
Number 2
Summer 1976

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Now, for a limited time only, we offer this special edition tankard commemorating the 25th anniversary of the National Athletic Trainers Association.

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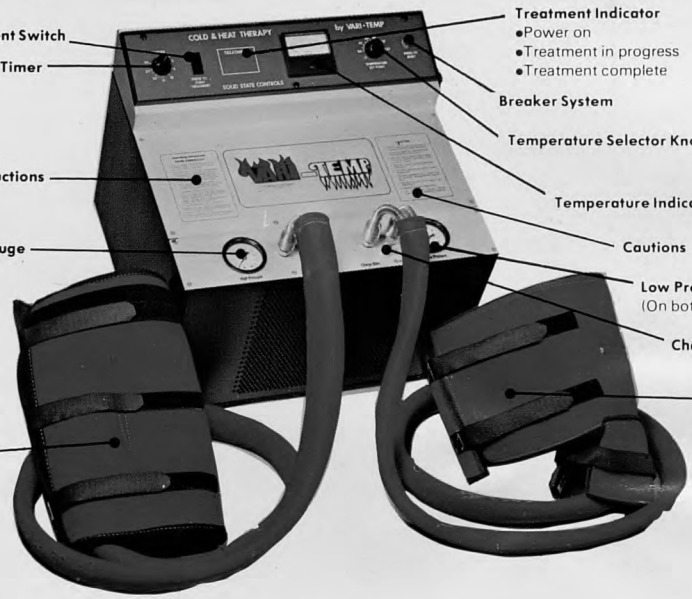

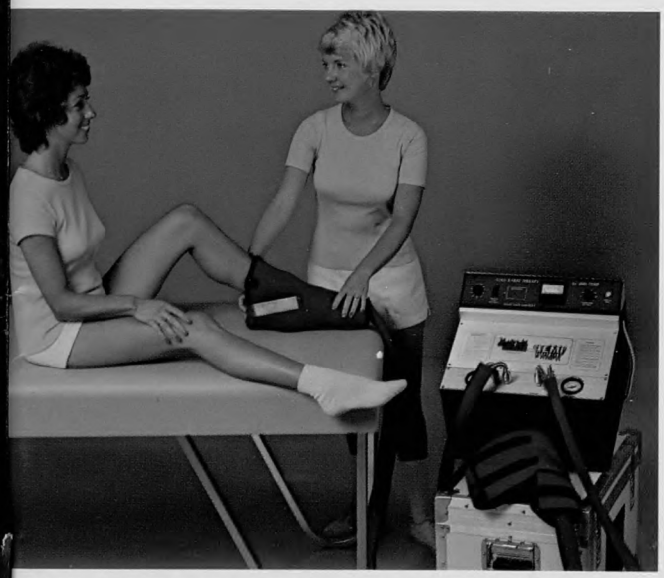

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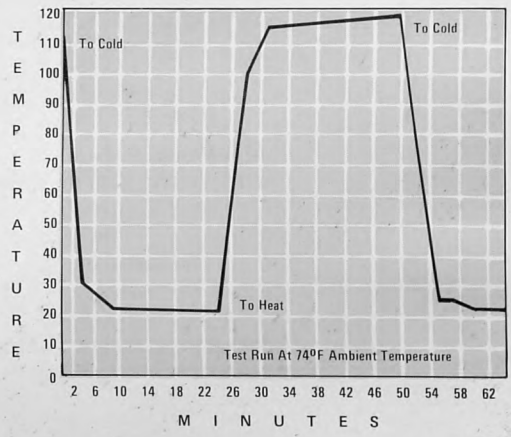

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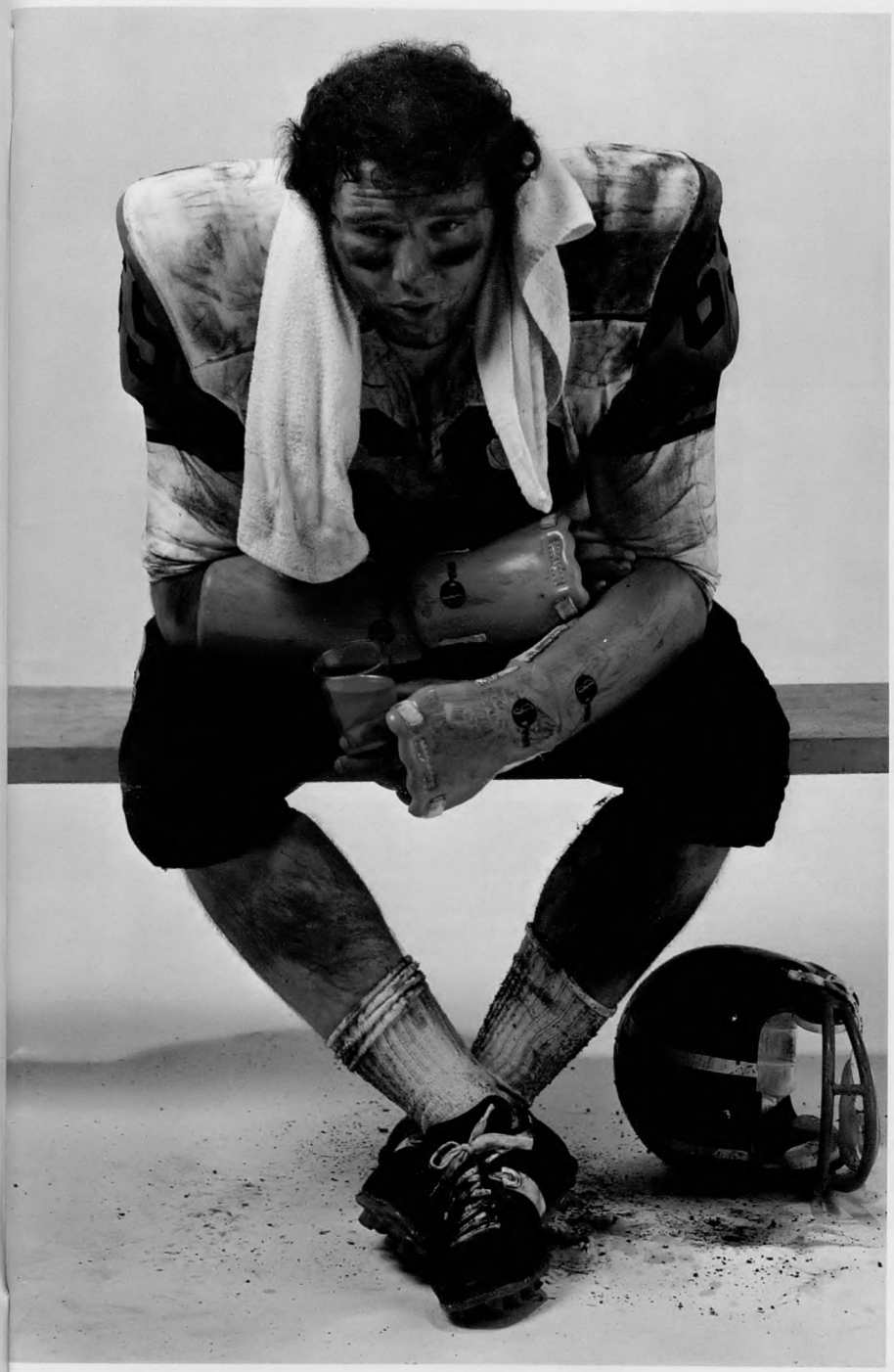
This athlete could be in danger*
...unless his body fluids are replenished!



*Excessive fluid loss and electrolyte depletion including potassium can constitute important factors in the production of heat stress complications. The best preventive is acclimatization. Intake of fluids containing adequate amounts of electrolytes, including potassium, is also recommended. BRAKE TIME is a scientifically formulated drink containing balanced quantities of important electrolytes.

BRAKE TIME is an ideally balanced, noncarbonated, electrolyte drink — deliciously flavored to provide:

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"Some of our key players would have seen a lot less game time if not for the excellent results we're getting with these systems."

"CYBEX and ORTHOTRON measure and rehabilitate not only strength, but power and endurance, too. This is extremely important for evaluating injuries and insuring complete rehabilitation."

"We've seen athletes in seemingly good condition with right to left side or agonist/antagonist imbalances, or a poor power to strength relationship. I think that quantifying and correcting these deficits not only reduces the chance of injury, but actually improves the athlete's performance."

"The entire system is surprisingly easy to use . . . testing methods are quickly learned and results are easily interpreted so that specific rehabilitation exercise and training programs can be tailored to the needs of the individual athlete."

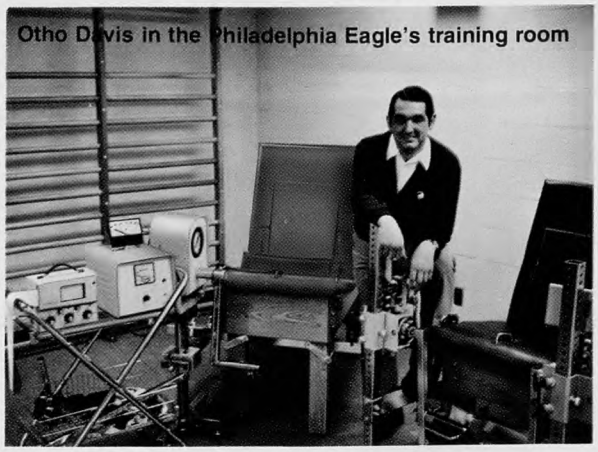
"A CYBEX could pay for itself in shoulder, elbow and wrist rehabilitation alone."

"The players have real confidence in the CYBEX and ORTHOTRON. They believe in results and are as interested in the chart recordings of their progress or performance as the team physician and I. They really want to use this equipment for strength maintenance and training programs."

"We have dramatically reduced our number of knee injuries . . ."

"One of the most eye-opening features of these systems is their ability to test and exercise at high contractile/velocities. Adequate or equal slow-speed strength, like developed with weights, is no guarantee of high velocity, power or endurance."

"After more than a year's experience with CYBEX and ORTHOTRON, we're convinced that we are getting much faster rehab results, reducing the number of re-injuries, and, in some cases, actually improving player performance and preventing injuries from occurring."



Otho Davis in the Philadelphia Eagle's training room

"The cost of CYBEX and ORTHOTRON is a small investment to protect any team's largest investment – talented athletes."

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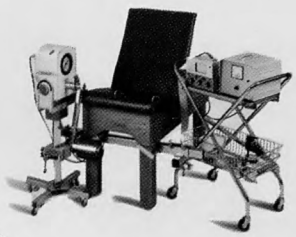

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ATHLETIC TRAINING

The Journal of the National Athletic Trainers Association

Volume 11 | Number 2 | Summer 1976

ARTICLES

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FROM THE PRESIDENT'S DESK

Dear N.A.T.A. Member,

I would like to apologize to the NATA members for the lateness of the spring journal, *Athletic Training*. The Journal Committee submitted the Journal to the printer in plenty of time for you to receive it in March. The printer informed us that there was a major equipment breakdown, which caused the delay.

The association has established an endowment type of scholarship fund. Our aim is to have this fund become large enough so that only the interest may be used for a number of scholarships. For this program to be a success, N.A.T.A. needs the cooperation of all its members. The gifts to this program are a direct contribution which each member can make to the future of the profession. Our future depends upon the education of our students. Please, give as much help as you can. Send contributions to:

William E. Newell, A.T.,C.
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3315 South St.
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All contributions are tax deductible.

A number of different states have asked N.A.T.A. for assistance in designing a license for athletic trainers. For this reason a special Licensure Committee was formed, which has written a model piece of legislation, and guidelines for implementation. At the June board meeting, this will be submitted to the N.A.T.A. Board of Directors for approval; copies will be made available to the different states. More information will be provided by the District Directors.

I am looking forward to seeing many of you in Boston at the annual meeting. The Program and Entertainment Committees have been working very hard to make this a successful meeting. Boston, in this Bicentennial year, should be especially interesting city to visit.

Sincerely,

Frank George

Frank George
President NATA

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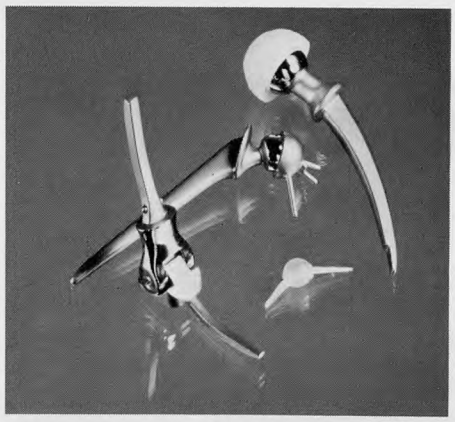
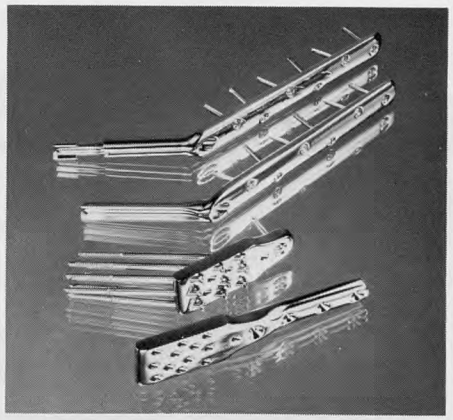
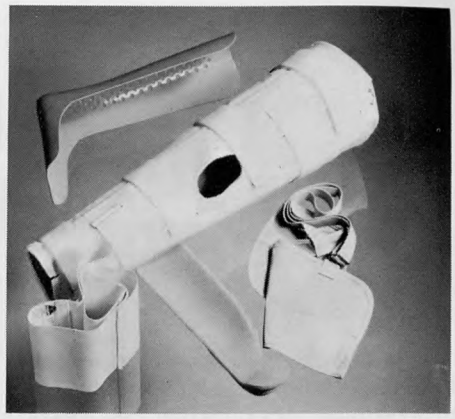
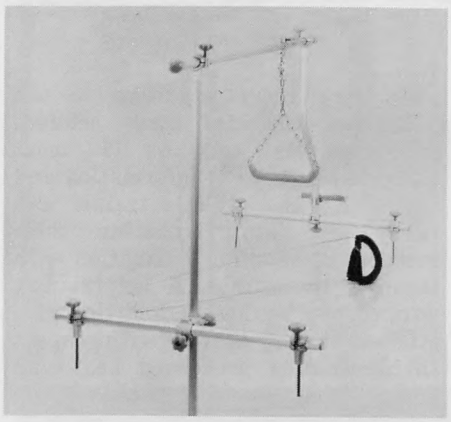

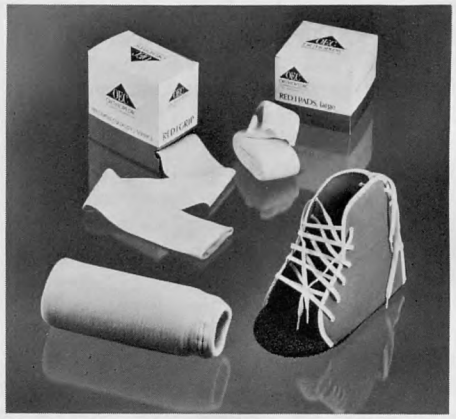

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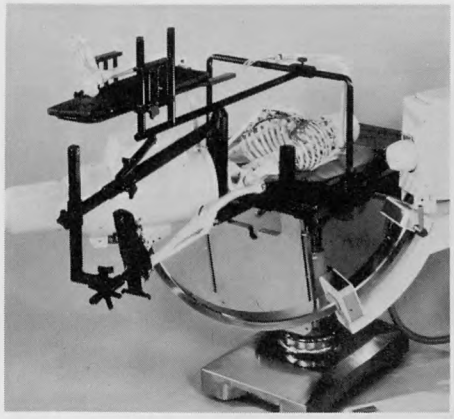
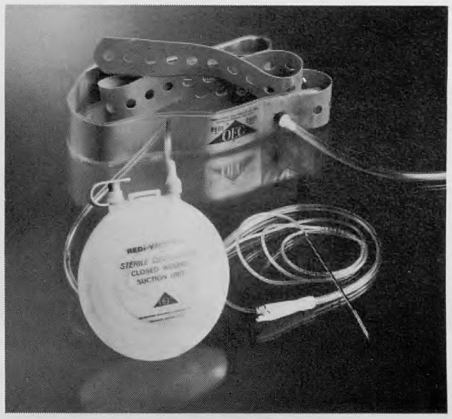
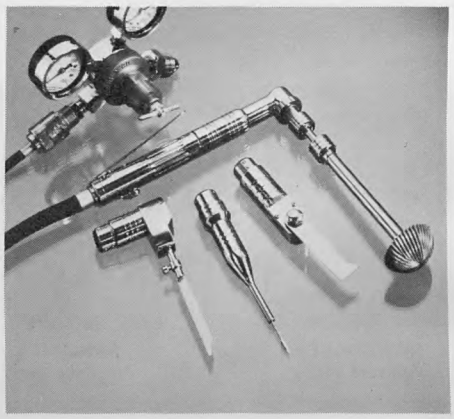

The Editorial Board

by Clint Thompson
Journal Editor
Certified Athletic Trainer
Michigan State University

It is amazing how a publication can become more valuable to a professional organization as years and issues go by. In the beginning, Figure 1, the Journal of the NATA was started to serve the same function as it does today, inform the NATA membership. The present staff of *Athletic Training* is proud of being among the long line of trainers who, over the years, have tried to assemble pertinent information to increase the knowledge of the athletic trainer.

To assist in this function a procedure has been developed to assure that when an article appears in the Journal it meets the high standards for which the NATA stands. Not only is the article content considered but such things as accuracy of citations, spelling, sentence structure, quality of photographs, tables and drawings must be regulated or the image of the NATA, as perceived through the Journal not only by our membership but by doctors, nurses, coaches, dentists, parents, principles or school administrators will be one of a less than top notch.

An explanation of the procedure through which an article goes after it is submitted can perhaps give an indication of the pains which are taken to try to keep the Journal of the highest quality.

Screening Procedures

When a prospective article is received, the author is notified of receipt of the article, Figure 2, and told that the article will be reviewed by an editorial board with a decision relayed to the author as soon as possible.

A copy of the article, complete with any photos, drawings, tables, etc., is sent to each of the five editorial board members who are pictured on this page. Each will critically review the article and return an evaluation sheet, Figure 3, to the editor along with their copy of the article which will contain comments made on the manuscript by each board member.

When the editorial board evaluations are returned to the editor, the author is notified of a decision, made by the editor, (Figure 4). The decision may be to not publish the article at that time or to return the article to the author for further suggested revisions. It has been the case, 95% of the time, that the article can be improved by revising either editorial content, submitting better photographs or tables, substantiating citations or references, or just plain sentence structure and punctuation.

On occasion the article is deemed totally unacceptable for publication in the Journal and the author will be so notified. In most situations the author is requested to revise the article and resubmit it to the editor in a given period of time. If it is resubmitted, the article is again reviewed, only by the editor, and if found acceptable, sent to the editor-in-chief for publication. When an article is sent in for publication, the author is so notified.

The above procedure is designed primarily to insure that the best quality article will appear in the Journal. It has been the experience of the editor that most authors are very patient and even express a thanks to the board for suggesting corrections in their manuscripts.

Case Studies

A more recent addition to the Journal is the case study section. Case studies can be a most enlightening type of information and one which the athletic trainer can really get into comparing their methods of handling a situation with those of the author. A helpful hint with respect to those submitting case studies, be very specific with respect to information presented i.e., time lapses (time spent in a cast, on crutches, on isometrics) rehab data (type of exercise used, sets, repetitions and weight used) and therapy data, (temperature of cold baths, whirlpools, dosage of ultrasound, etc.). Specificity is the key to comparison. Without pertinent information comparing is a guessing game.

An Invitation

It is with this in mind that the editor of *Athletic Training* enthusiastically invites potential authors to submit their manuscripts for consideration. At the same time be aware that the procedure described above is followed to help both the author and the membership received the quality exposure that is desired. Please refer to the Guide to Contributors that is published in every issue of the Journal for the proper procedures and style for a submitted manuscript. •

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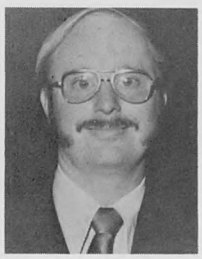

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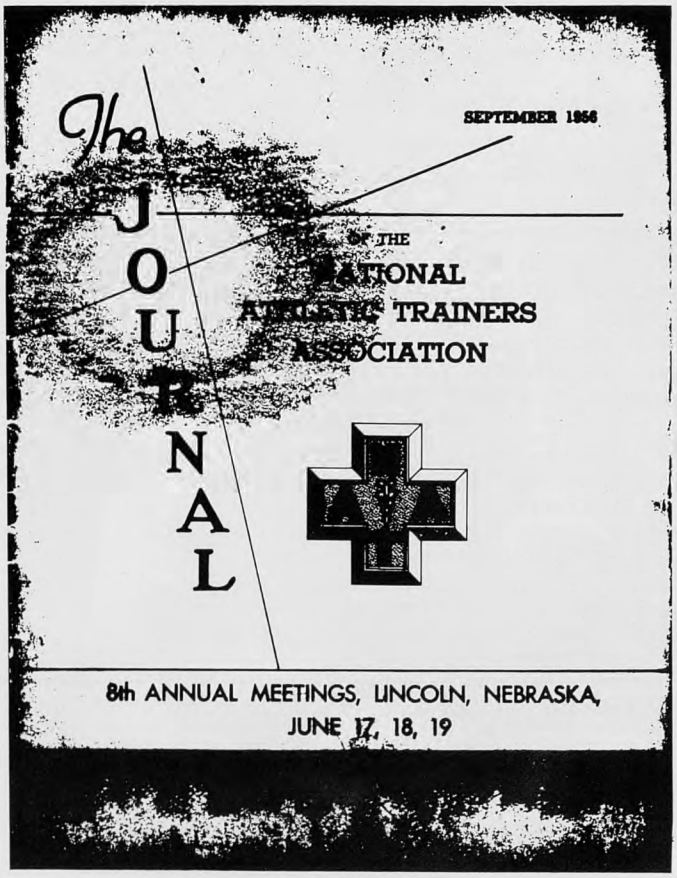

Figure 1

ATHLETIC TRAINING

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Thank you for your interest in the NATA.

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GUIDELINES

TITLE:
- Too long
- Not appropriate for material presented

TEXT:
- PREPARATION:
  - Subject matter inappropriate
  - General poor construction of article
  - Incomplete (Data missing, etc.)
  - Needs subheads through copy
  - Too many italics (over-emphasization)
  - Too long or too short for subject
  - Not detailed enough

WORD USAGE:
- Use of first person
- Poor grammar
- Too many useless words
- Too many uncommon words

STATISTICS:
- Inadequate statistics
- Need rechecking
- Improperly applied
- Lack of stats when use is indicated

ILLUSTRATIONS:
- Poor quality (Need originals, negatives)
- Suggest color
- Suggest additional art
- Needs legends

TABLES:
- Not essential to text
- Should be incorporated into copy
- Need rechecking (incomplete, in error)
- Headings needed

REFERENCES:
- Inadequate citing
- Not all cited in text (when indicated)
- Incomplete info for citations (Authors Names or Initials, Journal or Publisher Volume and Pages, Month and Year.)

GENERAL:
- Poor explanation of technique
- Errors in scientific basis for article
- Errors in presenting scientific aspects
- Suggestions of unethical practices
- Suggestions of commercialism

RECOMMENDATIONS:
- ____ Publish article as is
- ____ Publish with adjustments by editorial staff
- ____ Return to author for adjustments
- ____ Article is unacceptable for ATHLETIC TRAINI
- ____ Other _____

COMMENTS:

Signature _____

Date _____

Figure 3

ATHLETIC TRAINING

The Journal Of The National
Athletic Trainers Association

The Following Is The Results Of The Review by The Editorial Board Concerning:

ARTICLE _____

AUTHOR _____

TABULATION OF RECOMMENDATIONS:

____ PUBLISH ARTICLE AS IS

____ PUBLISH WITH MINOR ADJUSTMENTS MADE BY EDITOR

____ SUBMIT TO MEMBER OF ADVISORY BOARD FOR REVIEW

____ RETURN TO AUTHOR FOR RECOMMENDED ADJUSTMENTS

____ ARTICLE IS UNACCEPTABLE WITHOUT MAJOR CHANGES, ADDITIONS OR DELETIONS

____ ARTICLE IS TOTALLY UNACCEPTABLE FOR PUBLICATION IN ATHLETIC TRAINING BUT MAY APPROPRIATE FOR PUBLICATION IN ANOTHER JOURNAL

____ NO RECOMMENDATION FROM EDITORIAL BOARD MEMBER

COMMENTS OF EDITORIAL BOARD:

DECISION OF EDITOR:

CLINT THOMPSON, EDITOR _____ DATE _____

Figure 4

Tips From the Field:

OVCTA Trainer's Report Forms

The seven certified athletic trainers employed by the Ohio Valley Conference schools and organized as the Ohio Valley Conference Trainers' Association (OVCTA) devised the following two forms to be used when a trainer does not accompany a team on the road.

Form A is used when we wish to have an athlete strapped or treated by the host school's trainer. Each certified trainer fills out a form on each athlete and instructs him or her to present it to the host trainer. We have made sure that all student and graduate assistant trainers have been made aware of the forms. We feel that is is important to stress that the form must be signed by a certified trainer representing the visiting school. We do allow a student trainer to fill out a form, but we stress a thorough review by the head trainer before he signs it.

Form B is used when a team member from a visiting school is injured or taken ill in the absence of his trainer. Again, we stress the signature of the host certified trainer. This form is carried home to the athlete's trainer by the coach of the sport. We also make a duplicate that is mailed to the athlete's trainer by the host trainer. In this manner, we feel sure that at least one copy will get to our colleague.

A copy of each form, either A or B, is retained by each trainer who initiates its completion for his records.

We invite the reproduction and use of these two forms by other NATA members.

Submitted by:
Steve Moore A.T.,C
Tennessee Tech
Cookeville, TN 38501

Form A

FORM A

OVCTA TRAINERS REQUEST

ATHLETE:_____ SCHOOL:_____ SPORT:_____ DATE:_____

Please carry out the following procedures on the above named athlete in the absence of a qualified athletic trainer representing this athlete's institution.

Signed: _____
Certified Athletic Trainer

STRAPPING

1. ANKLE: ( ) Rt. ( ) Lt.
   - ( ) Prevent inversion
   - ( ) Prevent eversion
   - ( ) Doreiflexor strapping
   - ( ) Achilles Tendon strapping
   - ( ) Other: (Please describe)
2. KNEE: ( ) Rt. ( ) Lt.
   - ( ) Standard strapping for MCL, LCL, or meniscus sprain or tear
   - ( ) Hyperextension strap
   - ( ) Other: (Please describe)
3. ( ) Quad strap for strain or contusion (please underline condition) (loc._____)
4. ( ) Hamstring strap (loc. of strain _____)
5. ( ) Shoulder
6. ( ) Elbow hyperextension
7. ( ) Wrist sprain- (Navicular? ( ) Yes ( ) No)
8. ( ) Hand
9. ( ) Finger (Which one? _____)
10. ( ) Other: (Please describe)

ELASTIC BANDAGE WRAPPING

1. ANKLE: ( ) Ankle wrap ( ) Elastic Bandage
2. ( ) KNEE
3. ( ) THIGH
4. ( ) GROIN SPICA ( ) Medial rotation of hip ( ) Lateral rotation of hip
5. ( ) RIBS
6. ( ) ABDOMAN
7. ( ) SHOULDER SPICA
8. ( ) ELBOW
9. ( ) WRIST
10. ( ) OTHER: Describe

MODALITIES-TREATMENT

BODY PART TO BE TREATED:

( ) ICE ( ) MASSAGE ( ) BAG ( ) BATH
( ) CONTRAST BATH Temp. of warm water bath: _____°F.
( ) WHIRLPOOL Length of treatment _____min. Temp. of water _____°F.
( ) ULTRASOUND STIMULATION (Give details on the amt. of US and stimulation)

( ) G-5 MASSAGE
( ) DIATHERMY
( ) PARAFFIN BATH

EXERCISE (list exercise(s) to be done)

To the host trainer: I realize that each school may not have the above listed modalities in its training room. Therefore, I consent to allow the host trainer to substitute a treatment according to his/her own judgment as a certified athletic trainer.

Form B

OVCTA TRAINERS REPORT

ATHLETE:_____ SCHOOL:_____ SPORT:_____ DATE:_____

The above athlete sustained the following injury or injuries (circle appropriate word) while competing at _____.
name of host school

Injury or injuries occurred at approximately the following time:_____AM PM

This is a brief description of the treatment that was given to the above:

The athlete (was) (was not) seen by our team physician. Team physician's name_____

The athlete (was) (was not) (circle appropriate word) x-rayed at our local hospital.

The athlete was transported to the hospital by the local ambulance service ( ) Yes ( ) No

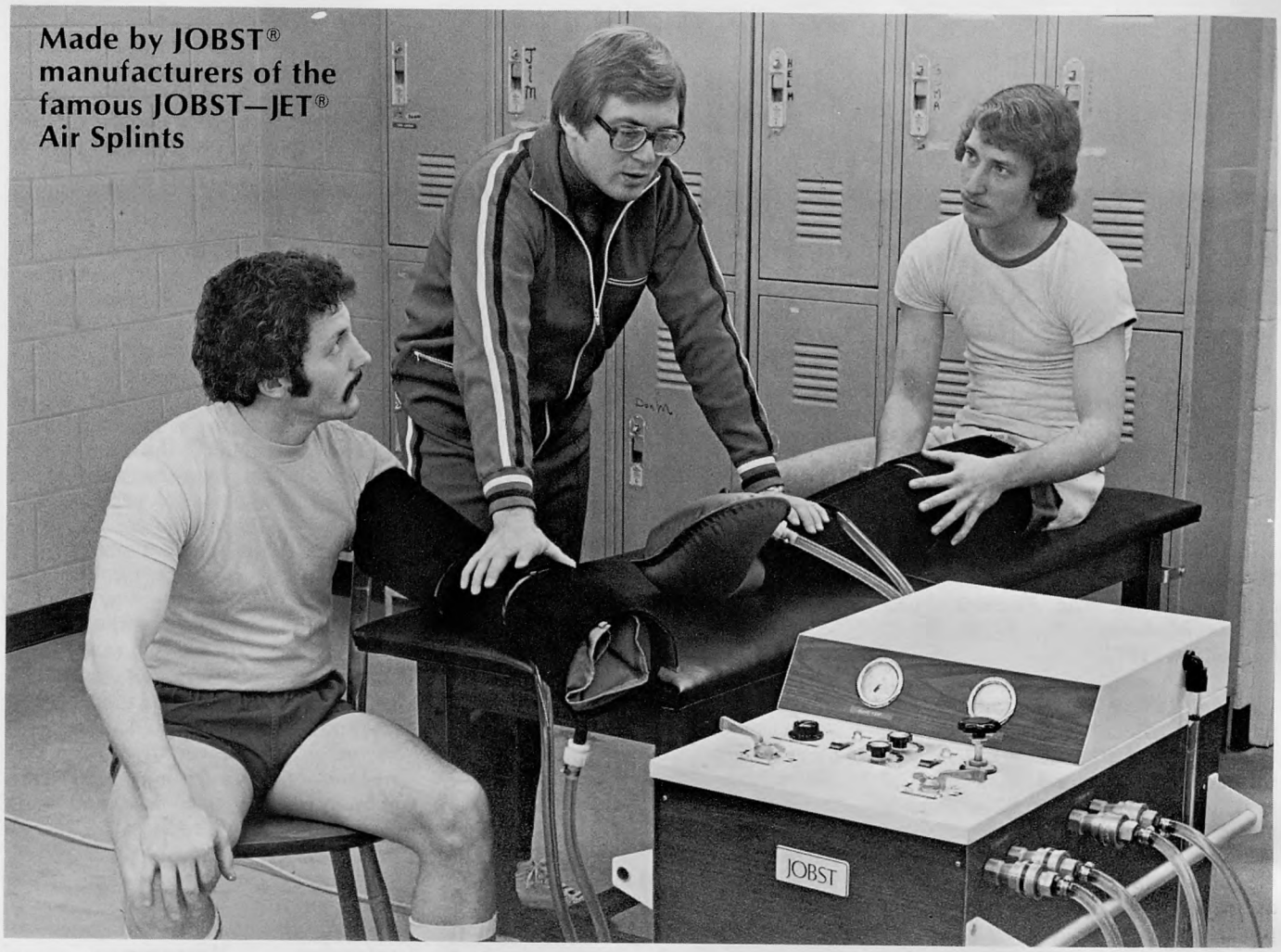
Copies of all hospital and physican's fees are enclosed ( ) Yes ( ) No

Recommendations of the attending physician are enclosed ( ) Yes ( ) No

The following equipment was loaned to the visiting school from the host school training room:

( ) crutches ( ) elastic bandage ( ) ice bag(s) ( ) splint ( ) other:

REMARKS:



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Name_____

Business or Assn._____

Address_____

City_____ State_____ Zip_____

ABSTRACTS

"What Causes Low Back Pain?" Allan J. Ryan, M.D. *The Physician and Sports Medicine:* Vo. 2: #9, 37-41 September, 1974

The incidence of disabling low back pain is significant among participants in a variety of athletic activities. The commonly prescribed measures of rest, medication to relieve muscle spasm and/or pain, a firm sleeping surface, and back strengthening exercise are often ineffective or aggravating. The education of physicians and other dealing with athletic injuries can improve the management of low back pain.

Effective management begins with a thorough examination and proper diagnosis. Often histories are not taken, observations such as discrepancies in lower extremity length go unnoticed, and x-rays are not taken. Due to the complexity of spinal structures, physicians interested in managing low back pain should learn to read spinal x-rays. Causes of low back pain reported by the author are: transitional vertebrae, spina bifida, scoliosis, partial unilateral fusion, spondylolysis, spondylolisthesis, and unhealed fractures. Many of the case studies presented had been told they had suffered a "strain".

Proper diagnosis can aid the physician in prescribing, where indicated, heel lifts, back supports, limitation of activities, and spinal fusion, as well as the measures mentioned above. In addition to education of physicians, the author recommends education of patients and recognition of the gaps currently existing in ability to cure many of the conditions which lead to low back pain.

Joe Berman

Zuti, W.B., and L.A. Golding. "Comparing Diet and Exercise As Weight Reduction Tools," *The Physician and Sportsmedicine*, 4:49-53, January, 1976.

The purpose of this study was to compare the effects of diet, exercise, and a combination of the two on the body composition of 25 adult women. The authors stated these were the three means an individual could use to reduce body weight. For the purpose of this investigation the women were randomly assigned to either a diet group, exercise group, or combination group. The three different groups were assigned different programs so they all experienced a 500 Calorie deficit per day. Physiological parameters were recorded for all subjects. These measurements included body weight, skinfold measurements, body circumferences, and body density. The data were treated by a two-way analysis of variance (ANOVA). The results of the ANOVA indicated that the weight losses between the three groups were not significantly different. These results also displayed that the method of weight reduction did not affect the amount of weight lost. It was further noted that the body density of the women in all three groups increased significantly. The study indicated that if a person exercises during weight loss, the loss of fat is greater, and there is an increase in lean body tissue. The authors proclaimed that the persons losing weight by diet alone, lost lean body tissue in addition to losing a lower percentage of fat. On the basis of their data the authors recommended persons interested in losing weight combine a lowered caloric intake with a good physical fitness program.

William Musnicki

Hypertrophy of the Vastus Medialis in Knee Extension: Rulon S. Francis, Ph.D., and David E. Scott, M.S., *Physical Therapy: Journal of the A.P.T.A.* Vol. 54, No. 10, page 1066 to 1070.

The inability of a patient to complete full knee extension following trauma of surgery to the knee, with an apparently normal quadriceps mechanism other than an atrophied vastus medialis muscle, strongly suggests the importance of the vastus medialis in completing terminal extension of the knee.

The authors hypothesize that, if the normal knee were restricted in the last 15 degrees of motion from complete extension in a progressive resistive exercise program, the vastus medialis muscle would fail to hypertrophy. The experimental design was set up the test ran.

Twenty college men with no apparent joint pathology or muscle weakness were selected. The test period ran eight weeks. All had two weeks of pre-training to test procedure. All were assigned daily experimental procedures with all excess activities restricted. Universal Gym Thigh and Knee Machines were used and adapted to limited the last 15 degrees of extension. Measurement of circumference were taken every two weeks. The groups were divided so that part lifted to 90 degrees extension while the second group lifted from 90 to 15 degrees of extension.

During the experimental period, the mean weight lifted increased to twenty-five kilograms, with several subjects increasing as much as six kilograms total poundage per extremity. The only significant increase in thigh measurement noted was at the 5 centimenter measurement above mid-patella. Group I (terminal extension) gained, 73 centimeters, while Group II (lacking the last 15 degrees) gained only .03 centimeters. In overall mean weight lifted, Group II gained the most because of the limited range they had to lift, but did gain less in circumference.

The authors concluded that it is apparent that the vastus medialism has a select action in completing terminal extension of the knee. Also that inability to complete terminal extension is attributed to weakness of the vastus medialis and not to the entire quadriceps weakness.

Charles A. Bolton


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"Helping Hockey Players Avoid Groin Pulls" Dennis Kovack *The Physician and Sportsmedicine* Vol 3 No. 11 November, 1975

In hockey, the groin pull probably is the most common injury that the player will suffer. A groin pull is the sudden stress of one of three muscle groups: the adductor, illopsoas, or rectus femorus. Exercise that benefit the three groups in full hockey equipment is to have two players lie on their backs, and one player his leg inside the others. The inside man pushes his leg apart abduction, while his partner squeezes in for adduction. For the first two days do five of each, then on the third day do 10 and continue on up to 15 by the end of the first week.

In treating a groin pull the materials needed will be a 4 inch elastic wraps and a length of felt 3/8 inches wide to provide support along with the pressure of the wrap. The immediate care for the first 24 hours after the injury should be with ice and 4 inch compresison wrap over the afflicted area. Ice massage should be continued for 2 or 3 days. On the fourth day ultrasound and heat should be used but sound should be used at low levels. After the injury a spica wrapping should be used until pain disappeared. After recovery muscle rebuilding program should be used.

C.J. Sean Murphy

Jackson, D.W. "Managing Myositis Ossificans in the Young Athlete," *The Physician and Sportsmedicine*, 3:56-61, October, 1975.

In an article concerning the management of myositis ossificans, Jackson outlined the injury as a heterotropic bone growth which is adjacent to, or attached to the underlying bone formation. Trauma is the primary, but not the sole cause of the injury. This abnormal bone formation may also develop after a muscle strain. Jackson indicated the most common site was the rectus femorus and biceps brachialis muscles, caused by severe contusion. Typically, a myositis ossificans in the early stages will result in decreased range of motion, with the muscle feeling firm and hot. Early roentgenograms are negative, but generally between the second and fourth week of injury calcific flocculations start to appear. There are three basic types of myositis ossificans: (1) the stock is connected to the adjacent bone, (2) the periosteal type with a broad continuity between the growth and adjacent bone and, (3) an ossification which has no direct contact to the underlying bone. Generally, the lesions are stabilized and remain unchanged but they may reabsorb. Treatment consists primarily of rest, because too rapid rehabilitation will only aggravate and cause additional injury. Once the contusion has occurred, initial bleeding should be kept at a minimum and muscle use restricted. Jackson claims the use of typical modalities by the trainer (ie. ultrasound, diathermy) are of little value in facilitating recovery. It has been observed that premature surgical removal of the growth lends to a high recurrence rate. The best method of preventing myositis ossificans is to protect against severe and chronic contusions.

William Musnicki

Ryan, A.J. "Round Table: Guidelines to Help You in Giving On-Field Care," *The Physician and Sportsmedicine*, 3:50-63, September, 1975.

The round table discussion by sportsmedicine physicians was an attempt to give guidelines for on-field care procedures. When an athlete is injured on the field, this presents a medical emergency which necessitates immediate and careful evaluation. A comprehensive list of specific injuries to athletes was discussed. These maladies range from head and neck injuries to dislocated shoulders and sprained ankles. The doctors agreed, their primary responsibility was to evaluate the extent of the injury or illness and determine when the athlete could return to competition. If this was not an immediate return the doctors also determined when and what treatment should be given. Further, it was mentioned the physician should not hesitate to use a stretcher or to put a player in the ambulance and send him to the hospital. The panel of physicians strangly emphasized that the decision to allow an athlete to return to play was contingent upon two considerations. First, the severity of the injury, and secondly, the level of competition at which the athlete was participating. That is to say, a professional athlete would be allowed to return to competition before a Little League or junior high participant, with similar injuries.

William Musnicki

"The Effects of Smoking Marihuana on Physical Performance:" Steadward, Robert D. and Mohan Stingh. *Medicine and Science in Sports* 7:309-311, Winter, 1975.

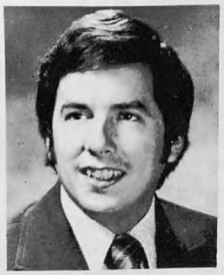
The purpose of this study was to determine the effects of marihuana on muscular strength, physical work capacity, forced vital capacity and flow rate of expiration. The method for administration was by smoking the marihuana instead of oral, subcutaneous, or intraperitoneal administration which would modify the potency.

Previous studies on the effects of marihuana smoking showed the most consistent physiological change was an increased heart rate. An increase in systolic and diastolic blood pressures had also been reported in some cases.

Twenty male subjects with a mean age of 23.1 years were randomly selected for this project. The first day of the experiment was used to familiarize the subjects with the equipment and to set the control data. The next two days were spent in the testing situation for one hour each day. The subjects were required to smoke 1.4 grams of either marihuana or a placebo to see what effect there would be. The results indicated there was never a significant change from the control to the use of the placebo on any of the data. After use of marihuana there was significant changes with an increased heart rate, increased systolic and diastolic blood pressures, and a significant drop in physical work capacity. There was no significant differences in hand grip strengths and vital capacity and expiratory flow rate.

The authors concluded that the marked significant increase in the subjects' resting pulse rate and resting blood pressure after smoking marihuana could help explain the significant drop in the work capacity. Subjects were able to perform the same work at the expense of higher heart rates. •

Del Lark



Editor's Comments

by Rod Compton, A.T.,C.
Editor-in-Chief
East Carolina University

1976 SCHERING SYMPOSIUM

This issue completes the papers from the 1976 Schering Symposium. The response from the membership concerning these articles has been fantastic. The 1976 Symposium promises to be just as beneficial. Plans are being made to publish the papers from the Boston Symposium, "Low Back Problems". Please make every effort to attend the Symposium on June 13, 1976 at the Convention and support this program. Thank you Schering!

DON'T PASS IT – GIVE IT

The Scholarship Committee reports that the drive to raise money for the scholarship fund is going well, but they still need your help, no matter how big or small the donation. Please contact William "Pinky" Newell at Purdue University. Give a buck!

DEADLINE DATES

If you have any materials, announcements, letters, etc. that you wish to be considered for the Journal, please be sure to send them to the appropriate Journal Committee member by the following dates:

Issue	*Deadline*
Spring	January 15
Summer	April 1
Fall	July 15
Winter	October 15

This is extremely important for dated material. Otherwise the material, if accepted, will be held for the next issue.

"TIPS FROM THE FIELD"

This issue has the second "Tips From The Field", which was developed as a result of request from the membership. This section has unlimited potential for the exchange of practical information within the organization. However, it will require the cooperation of the members to keep materials coming in for the section. So send any materials you think are appropriate to me.

KEY PEOPLE

Trainers, of all people, should appreciate the people doing a great deal of work, behind the scenes, receiving little or no credit for their efforts. Two such people that are of extreme value to the Journal and yours truly are Phyllis Langston and Mary Edgerley. Phyllis is my secretary and handles much typing, correspondance, proofreading, etc. Mary handles the advertising and subscription portions of the Journal. Without the efforts of these fine women the Journal could not exist. I take this opportunity to say a public "thank you"!

See you in Tea Town!

GUIDE TO CONTRIBUTORS

Athletic Training, the Journal of the National Athletic Association, welcomes the submission of manuscripts which may be of interest to persons engaged in or concerned with the progress of the athletic training profession. The following recommendations are offered to those submitting manuscripts:

1. Eight copies of the manuscript should be forwarded to the editor and each page typewritten on one side of 8 ½ x 11 inch plain paper, triple spaced with one inch margins.
2. Good quality color photography is acceptable for accompanying graphics as well as glossy black and white prints. Graphs, charts, or figures should be of good quality and clearly presented on white paper with black ink, in a form which will be legible if reduced for publication.
3. The list of references and citations should be in the following form: a) books: author, title, publisher with city and state of publication, year; b) articles: family names, initials and titles of all authors, title of article, journal title, with abbreviations accepted as per Index Medicus, volume, page year. Citations in the text of the manuscript will take the form of a number in parenthesis, (7), directly after the reference or name of author being cited, indicating the number assigned to the citation in the bibliography.
4. It is the understanding of the editor of *Athletic Training* that manuscripts submitted will not have been either previously published nor simultaneously submitted to another journal. The author accepts responsibility for any major corrections of the manuscript as suggested by the editor.
5. It is requested that each submitting author include a brief biographical sketch and acceptable photograph of themselves. Please refrain from putting paper clips on any photograph.
6. For reprints, authors are authorized to reproduce their material for their own use or reprints can be reproduced at time of initial printing if the desired number of reprints is known.
7. Unused manuscripts will be returned, when accompanied by a stamped, self-addressed envelope.

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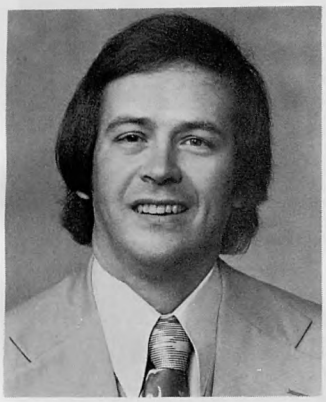
Schering

The 1975 Schering Symposium on Musculotendinous Injuries:



James R. Andrews, M.D.

Musculo-Tendinous Injuries of the Shoulder and Elbow in Athletes

James R. Andrews, M.D.
George M. McCluskey, Jr., R.P.T.
William D. McLeod, Ph.D.

Edited By
Rod Compton, AT,C
East Carolina University

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WILLIAM D. McLEOD, Ph.D.
Instructor of Orthopaedic, Section of Sports Medicine, Division of Orthopaedic Surgery, Tulane University School of Medicine; Data Systems Manager and Biomechanical Research Director, Hughston Orthopaedic Clinic, Columbus, Georgia.

The purpose of this article is to define the pitching act and to correlate it with the mechanism for musculotendinous injuries of the shoulder and elbow. Both prevention and rehabilitation of these injuries will be discussed.

This subject is an enigma to the coach, the trainer, the therapist and the orthopaedist. All too frequently one cannot determine why an athlete has shoulder or elbow pain and why he can't participate. Factors that must be considered include: the athlete's ability, dedication, desire to win, and desire to return to previous competitive levels.

The mechanism of injury must be studied. With the understanding of this mechanism guided by the in-depth knowledge and experience of

the trainer a diagnosis can be made.

One must then consider the athlete's instability and convince him to dedicate himself to re-education or, if necessary, to consider surgical intervention.

THE PITCHING ACT

The pitching act (mechanism has been well defined by Doctors Joe King and Hugh Tullos(5) in Houston, Texas and Doctor Frank Jobe and Robert Kerlan(2) in Los Angeles, California. A review of the pitching act is necessary before discussing musculotendinous injuries.

The pitching act has been divided into the following phases by Doctors Tullos and King(5).

1. Wind-up.
2. Cocking.
3. Acceleration.
4. Release.
5. Follow-through.

Wind-up

After the stance (Figure 1) has been taken, the wind-up begins (Figure 2). As the wind-up is completed, the pitcher moves into the cocking phase (Figure 3).

Cocking

The shoulder is abducted to ninety degrees, it is hyperextended and externally rotated to the extreme. The anterior capsule of the shoulder is taut and traction stress is placed on the anterior capsule and internal rotators of the shoulder. All major muscles about the shoulder are working during this phase. The elbow is flexed to about forty-five degrees and is cocked dynamically by both the flexors and extensors, which means that both the biceps and triceps are taut during this phase.

Acceleration

The acceleration phase begins with the forward motion of the ball and ends with the release of the ball. In this phase the body is working against the arm. As the body is brought forward, it whips the arm along with it creating a tremendous valgus stress on the elbow, and maximum medial distraction. The ball is release at about head level to complete the acceleration phase.

Release

The release phase begins with the release of the ball and is concerned with ball control (Figure 5). A fast ball, slider or curve is determined during this phase. Pronation of the forearm is the movement of importance during the release phase.

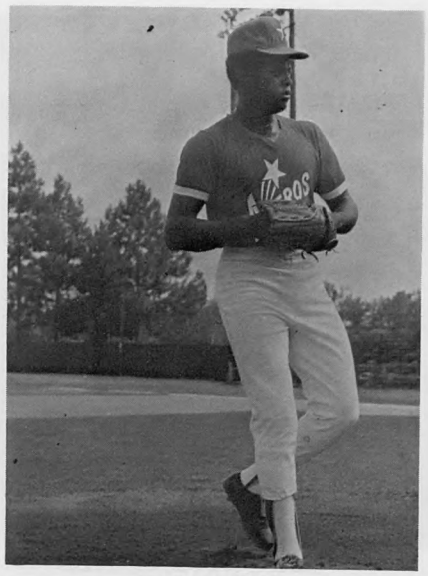

FIGURE 1
Pitching Act - Stance Phase

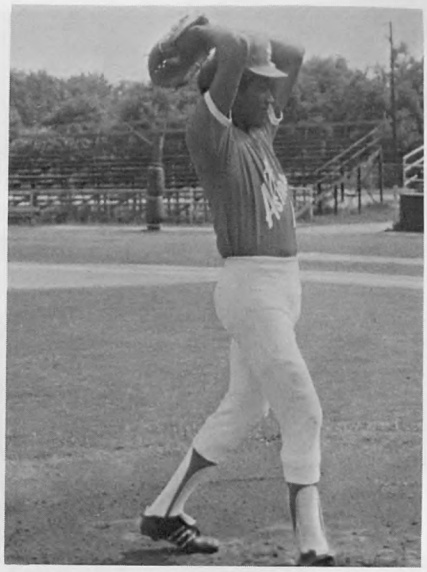

FIGURE 2
Pitching Act - Wind up

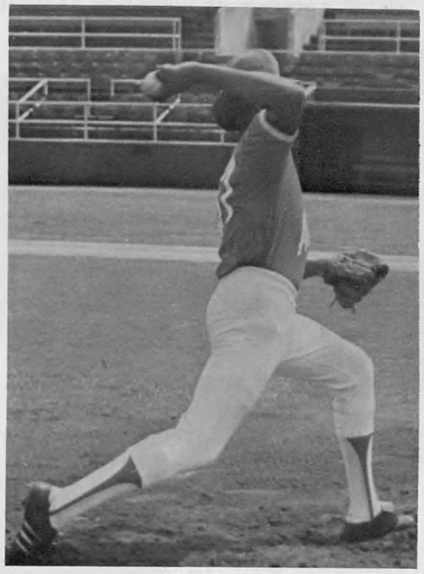

FIGURE 3
Pitching Act - Cocking

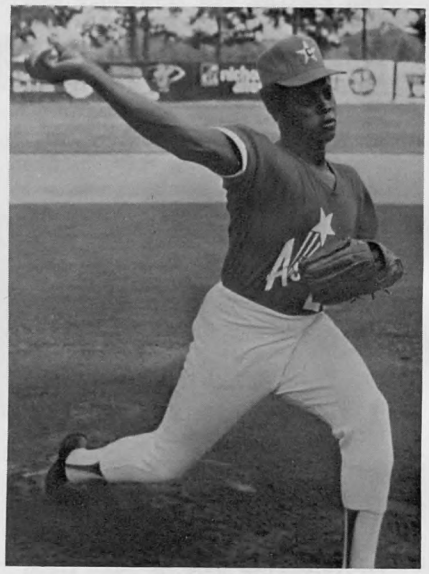

FIGURE 4
Pitching Act - Acceleration

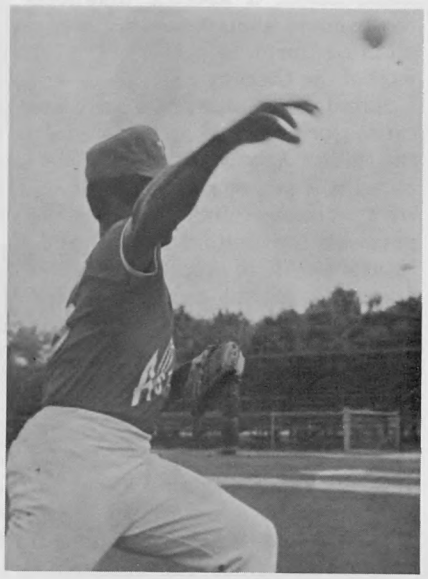

FIGURE 5
Pitching Act - Release

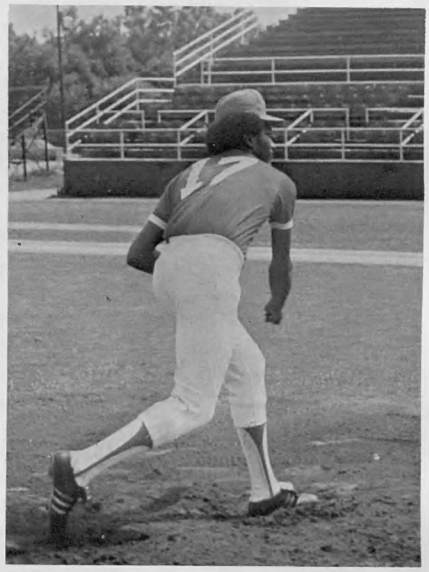

FIGURE 6
Pitching Act - Follow Through

This pronation of the forearm causes a dynamic stress to be placed on the medial flexor mass of the forearm.

Follow-Through

The follow-through is a controlled deceleration of the arm and body (Figure 6).

CLINICAL PATHOLOGY ASSOCIATED WITH MECHANISM OF INJURY

Musculotendinous injuries of the shoulder and elbow are classified as muscle strains. According to the *American Medical Association Standard Nomenclature of Athletics Injuries*, strain is defined as follows:

> Grade I strains of muscles are mild with tearing of muscle fibers. Symptoms are minimal and usually the time loss and function loss is minimal. These are the strains that are usually treated with ice, compression and elevation and respond quickly.
>
> Grade II strains are moderate and have some tearing of the muscle fibers, however, the tearing is incomplete. They may be associated with some functional disability and moderate loss of time from athletic activity.
>
> Grade III strains are associated with complete rupture of the musculotendinous unit and are the more severe injuries. They are associated with severe functional disability and considerable loss of time from athletic activity.
>
> Muscles are strained by overloading. A muscle can be loaded intrinsically or extrinsically. Since the injury sustained depends substantially upon the type of loading, it is important to understand the difference between the two.(1)

Intrinsic loading is the loading by a voluntary contraction and shortening of the muscle.

Extrinsic loading occurs while the muscle is being lengthened due to outside forces (i.e. the contraction causes the muscle to stop lengthening).

The intrinsic loading of the muscle is characteristically done during the acceleration phase of the pitching act. Extrinsic loading is done during the cocking phase or the follow-through.

Intrinsic overloading causes disruption of the muscle mass. Extrinsic overloading causes separation of the muscle from its attachment.

This should point out the importance of understanding the pitching mechanism and correlating it to the probable site of the musculotendinous injury. This is important in determining the type of musculotendinous injury. In general, surgery is not necessary if the rupture occurs at the muscle belly. If the injury occurs at the origin or especially at the insertion, then surgery is indicated. Correlating the phase of the pitching act with the subsequent injury is important in localizing the site and severity of the injury.

CLINICAL ENTITIES

Shoulder pain can be divided into either anterior or posterior shoulder pain.

Anterior shoulder pain is commonly associated with opening up too soon during the pitching act. When the body opens up too soon, it leaves the arm behind and a tremendous stress is placed on the anterior structures of the shoulder joint and the elbow.

Posterior shoulder pain is associated with the body staying closed too long or pitching entirely with the arm.

Anterior or posterior shoulder pain can be caused by inflammatory response to micro trauma (I.R.M.T.) a term coined by Doctors Robert Kerlin and Frank Jobe.(2) I.R.M.T. is defined as a minute musculotendinous strain and responds well to rest and anti-inflammatory agents. Generally, in these cases, a specific diagnosis is never made. Instruction in the proper pitching form is a very important part of the therapy.

Sub-deltoid bursitis is a common cause for anterior shoulder pain in the older age athlete. The deltoid bursa is a sac, or saclike, cavity filled with viscous fluid and situated between the deltoid muscle and the rotator cuff of the shoulder. The diagnosis of sub-deltoid bursitis is made by palpation of the area of localized tenderness and the activity producing pain. It is usually associated with pain during the acceleration phase.

Subscapularis tendinitis, a type of anterior shoulder pain, occurs in the tendon as it crosses the anterior shoulder. It is associated with acceleration since the subscapularis is a strong internal rotator of the shoulder and large internal rotation forces are necessary to produce the acceleration. The area of localized tenderness is medial to the sub-deltoid bursa. Also during the acceleration phase, the other strong internal rotators of the shoulder can be affected and cause anterior shoulder pain.

Rupture of the pectoralis major muscle is not common in athletes but does happen.(3) Rupture of this muscle occurs from the cocking through follow-through phase when the arm is going from extreme external rotation to extreme internal rotation. Rupture can occur at its sternal origin or clavicular origin and at its insertion. This diagnosis is made by history of extrinsic overload and by the site of local tenderness. The pectoralis muscle belly can rupture during the intrinsic loading in the mid phase.

Rupture of the latissimus dorsi is akin to rupture of the pectoralis major. It also can occur during the cocking phase, acceleration phase, or follow-through phase.

A posterior shoulder pain can be associated with loss of external rotation of the shoulder from latissimus dorsi contracture. The pitching act requires an extreme of external rotation of the shoulder. A well developed pitcher loses a relative internal rotation to gain an extreme external rotation while his total rotational arc remains the same. Athletes can develop posterior shoulder pain and inability to pitch from contracture of the latissimus dorsi. the common denominator to this problem has been off-season weight program which has strengthened the internal rotators but has not stretched them (Figure 7).

Biceps tendinitis and subluxation of the long head of the biceps occurs during the cocking phase while dynamic muscular tension is maximum. This creates anterior shoulder pain (Figure 8, 8B).

Likewise anterior subluxation of the humerus occurs during the cocking phase (Figure 9). Also, posterior subluxtion and resultant shoulder pain can occur during the cocking phase from dynamic contracture of the posterior shoulder musculature (Figure 10). All too often anterior subluxation versus posterior subluxation are confusing because they can occur in the same pitching phase, anterior subluxation from too little a dynamic support and posterior subluxation from too great a dynamic support.

Tendinitis and traction spurs from the origin of the long head of the

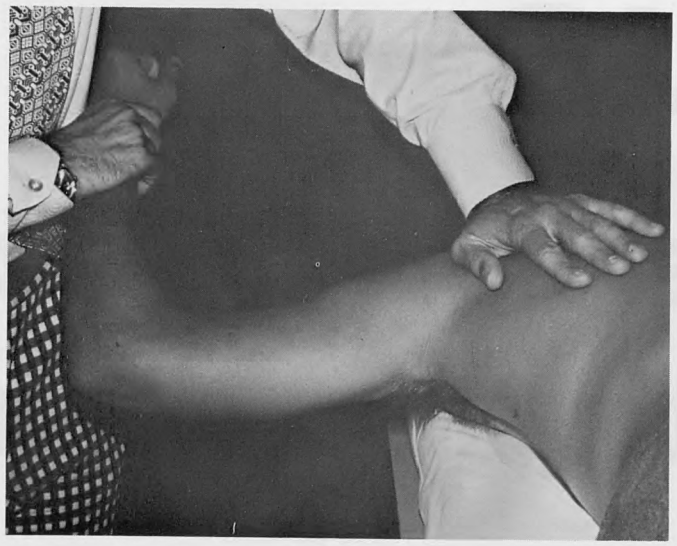

FIGURE 7
Examination for internal rotation contraction of the shoulder secondary to latissimus dorsi contracture.

FIGURE 8 A & B
Examination for sitting subluxation of the biceps.

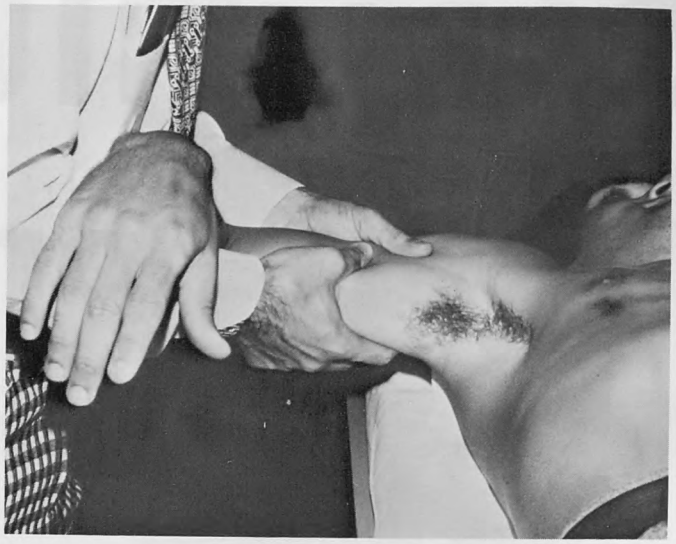

FIGURE 9
Examination for recurrent anterior subluxation of the shoulder.

FIGURE 10
Examination for recurrent posterior subluxation of the shoulder.

triceps occur as a pathologic response to the cocking phase. These spurs can be quite large and completely disabling.

Rotator cuff ruptures do occur about the shoulder as a musculotendinous injury but are generally associated with a direct blow or trauma. A rupture of the long head of the biceps from its glenoid origin occurs during the cocking phase from extrinsic overload. As a general rule this is more of a cosmetic than functional problem and treatment is non-operative.

Rupture of the distal insertion of the biceps from the radial tuberosity occurs with violent extrinsic contracture of the biceps. An example of this is a weight lifter doing a cling and jerk. This diagnosis

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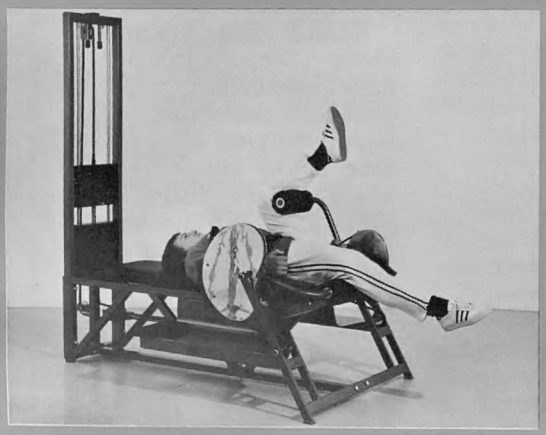

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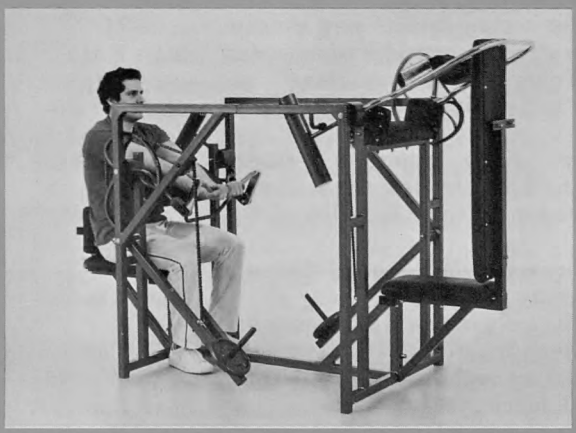

Biceps/Triceps Machine

4-Way Neck Machine

should be obvious with the muscle belly retracting proximally and the treatment should be operative.

The muscle belly of the biceps can also rupture from intrinsic overload and a sudden direct blow. Treatment for this is non-operative with ice, compression and splinting.

As alluded to earlier, the release phase of the pitching act is associated with ball control. Ball control is obtained by pronation of the forearm. Thus the pronator teres can be over stressed from intrinsic loading along with the wrist flexors and the other supporting muscles from the medial side of the elbow.

These same medial elbow supporting muscles can be ruptured by extrinsic overload by the valgus stress applied during the acceleration phase.

The triceps tendon can also be stressed from extrinsic overloading during either the cocking phase or release phase. This creates a tendinitis with loose body formation and ectopic bone formation as the triceps inserts on the olecranon tip. This classically is responsible for the elbow flexion contracture seen in the pitching elbow. Operative intervention in the late cases has been very successful.

PREVENTION AND REHABILITAITON

There are many concepts about preventing and treating injuries to the shoulder and elbow. Common to most concepts is the thinking that strengthening and stretching exercises receive top priority. Many techniques of exercise can be physiologically supported. As stated previously, it is extremely important to understand the mechanics of the throwing arm and the pathology that is likely to take place during different phases of the pitching act. In designing an exercise program to prevent injuries to the shoulder and elbow, you must be aware of individual differences of the athletes involved. For example, it is important to know the amount of flexibility, tightness, strength and weakness in the upper extremity of each athlete.

Emphasis must be placed on the importance of balance strength between the agonist and antagonistic muscle groups since dynamic stability plans such an important part in the pitching act.

Conditioning exercises for the throwing arm consist of:

1. Strengthening exercises
2. Stretching exercises
3. Proper warm-up

Exercise programs are generally designed to accomplish strength, coordination and endurance. In the pitching act, strengthening exercises can best be accomplished through isometric exercises. Endurance and coordination can be accomplished through the physical conditioning program.

Isometric exercises are carried out to strengthen the following motions in the shoulder.

1. Flexion
2. Extension
3. Abduction
4. Adduction
5. Horizontal abduction
6. Horizontal adduction
7. Internal rotation
8. External rotation

Manual resistance using the buddy system is recommended.

Another exercise recommended to strengthen the muscles that stabilize the shoulder and elbow and to gain or regain more active motion in the joints is the Medi Exercise Ball. This is an advance/method of conditioning developed by Bob Bauman, a nationally known athletic trainer.

The Contraction-Release Theory of exercise affords a good technique to regain motion to tight joints especially those where muscle spasm prevents normal range of motion. This is expecially true in regaining external rotation of the shoulder joints.

Passively stretching the elbow and lower arm by taking the hand and wrist into flexion and extension with the elbow in extension the shoulder in internal and external rotation helps to prevent tightness, therefore, providing a larger arc of motion which contributes to better ball control.

After the above exercises have been carried out proper warm up is essential. Most athletes have their ideas about what it takes to get them ready for competition. A new concept that warrants consideration using Multi-Toner balls weighing six ounces and eight ounces is described below.

After going through proper loosening up exercises, the following exercise format could be followed.

1. Throw regular baseball fifteen to twenty times.
2. Toss a six ounce Multi-Toner ball fifteen times.
3. Toss an eight ounce Multi-Toner ball fifteen times.
4. Throw a regular baseball twenty-five to thirty times.

This allows the athlete to condition his throwing arm, providing more strength and more control. Throwing the regular weight baseball after tossing the weighted Multi-Toner Ball could also have a good psychological effect on the player, especially the pitcher.

Exercise programs should also be considered as an intregral part of the rehabilitation process following an injury. The mechanism of injury must be fully understood to intelligently design an exercise program which will assist the athlete to return to his previous competitive level. Proper coaching techniques and correction of improper throwing form is vital in both prevention and rehabilitation.

CONCLUSION

Musculo-tendinous injuries of the shoulder and elbow in athletes can best the comprehended by first understanding the pitching act. The mechanism for a specific injury can be correlated with a particular phase of the pitching act. Unfortunately this act is unnatural and leads to overload. This overload is produced by either extrinsic or intrinsic muscular action.

Often the injury can be prevented by proper body form but all too often the repeated I.R.M.T. (inflammatory response to micro trauma) from years of pitching leads to inevitable more specific musculo-tendinous injuries.

The shoulder and more specifically the elbow can respond to rehabilitation and preventive measures and under favorable conditions and timing to surgery.

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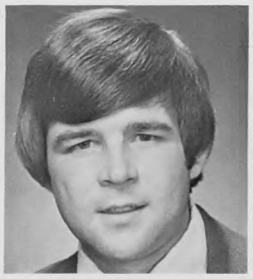
A Comparison Between A Conventional and Field Method In The Development Of Leg Strength And Power

One of the most important factors in predicting athletic success is the ability to exert power (5). Power is defined as the product of force production and velocity. Although it would appear that strength and power are interrelated, it may be that certain types of strength development may be so specific as to be of little value in the improvement of power.

It is the responsibility of the coach/trainer to find some method of strength training which can be practically applied in the typical athletic situation. Calisthenics as a means of increasing strength has been used widely. While this technique may be effective at the onset of a training program, once the muscles have developed to a point where body weight no longer offers adequate resistence, strength improvement ceases. Morehouse and Rasch (17) have stated that no matter how much a muscle is used or how much it fatiques, it will not become stronger unless it is overloaded.

An effective method of developing strength and power is through the use of progressive resistance weight training with the use of mechanical weight supported devices which provide needed resistance while offering maximal safety. These devices are usually large and cumbersome. While they provide for adequate strength development, they call for substantial expenditure of money and are not appropriate for field conditions.

Recently, manual resistance exercise has become popular, especially with football coaches. This muscle overload technique requires two individuals. While a partner applies resistance, an isometric contraction is held for a period of time (6 counts) followed by a gradual decrease in resistance, with a consequent contraction through the full range of motion.



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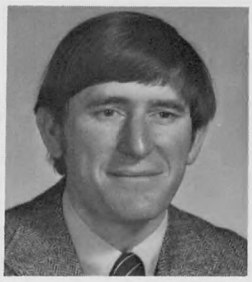

Edmund J. Burke received a B.S. from Syracuse University in 1964, a Masters degree from East Carolina University in 1969 and a Ph.D. from Temple University of 1972. He has been assistant professor of physical education in the school of HPER at Ithaca College since 1972. His areas of specialty are Exercise Physiology and Anatomy.

The purpose of this paper is to compare strength and power changes resulting from:

1. A conventional progressive resistance training program.
2. A manual resistance field method of strength training.
3. A control group.

Review of Literature

Asa and Liberson (1), Baer (2) and Matthews and Drause (14) have concluded that isotonic is superior to isometric training in strength improvement. Berger (4) found that dynamic (isotonic) exercise with three sets of six repetitions was superior to static (isometric) exercise, while static exercise was superior to dynamic when only two sets of two repetitions were performed dynamically. Similarly, Peterson (18) found no significant difference between isometric and isotonic exercise when ten isometric contractions were performed by differences were found in favor of isotonic exercise when only daily isometric contraction was performed. McGraw and Burnham (16), Salter (19), and Wallace (22) found no significant difference in the development of strength when comparing isometric and isotonic training. Coleman (9) concluded that gain in muscle strength following an isotonic and isometric training program will occur at similar rates.

Zorbas and Karpovich (23), Chui (3) and Capen (6) have examined the effects of weight training on the speed of muscular contraction. Each found weight training to have a positive benefit in the development of movement speed and power at the specific joint. Start et al (20) found little or not relationship between strength and power variables.

Only one study was found which dealt specifically with the use of manual resistance exercise. Tammariello (21) concluded that manual resistance was beneficial in the development of strength.

Method

Forty-five male college students (age, X = 19.5 years) volunteered for participation in a six week strength training study. Subjects were randomly assigned to one of two experimental groups or a control.

Training

The conventional group trained three times per week utilizing a Universal Gym. Initially, resistance needed for one maximal contraction (1RM) was determined for a leg press and leg flexion. Each subject trained three times per week with three sets at 80% of 1RM. At the end of each two weeks the resistance was increased by 10 pounds.

The field group likewise trained three days per week with the resistance provided manually through the aid of a partner. The muscular contractions were performed maximally each time for a duration of six seconds. As the last second was counted, manual resistance was gradually relieved to allow the limb to travel through a full range of motion. Ten muscle contractions were designated as a set with a single training period consisting of three sets of flexion and extension. Exercising the extensors, the subject sat upon a table with his hands holding the sides. A partner provided the resistance parallel to the anterior portion of the lower limb at a point slightly above the maleoli with the leg in approximately 115 degrees of extension. Exercising the flexors, the subject was in prone lying position with the tested knee being flexed at approximately 65 degrees of flexion. A partner provided resistance perpendicular to the posterior aspect of the lower leg at a point slightly above the maleoli.

A third group served as a control and did not undergo any training involving the knee flexors or extensors.

Criterion Measures

Measures of knee strength and power were made prior to and following a six week training period. Knee strength was measured mechanically by means of a cable tensiometer utilizing a method described by Clarke and Clarke (8). The instrument was calibrated prior to testing through a method of comparing scores obtained on the tenisometer with weights of know value suspended from the cable.

During knee flexion, the subject was positioned in prone lying position with his patella placed just at the edge of the table. His head rested upon folded arms with the tested knee being flexed at an angle of 165 degrees as measured by use of a goniometer. A regulation strap was fixed on the tested leg around the lateral and medial maleoli. The pulling assembly was attached to a hook at the lower end of the table. Insuring measurement accuracy, caution was taken to prevent extension of the spine by holding the subject's chest on the table.

During knee extension, the subject was positioned in a backward leaning-sitting state. His arms were extended to the rear with his hands grasping the sides of the table. The tested knee was fixed in 115 degrees of extension as measured by use of a goniometer. A regulation strap was placed on the tested leg around the lateral and

Table 1

Mean Changes in Strength and Power After Six Weeks of Training

Variable	Training Group	Pre-Test $\bar{X}$	S.D.	Post-Test $\bar{X}$	S.D.	$\bar{X}$ Diff.	F ratio	Adjusted $\bar{X}$ Diff.
Cable Tensiometer Strength (Ft Lbs)	Manual Resistance Field Technique	96.8	13.59	98.9	12.97	3.53		3.37[b]
	Conventional Progressive Resistance	138.4	16.52	144.7	16.67	6.33	9.91[a]	6.03[b]
	Control	105.5	15.89	105.7	16.42	.23		.33[c,d]
Margaria Test of Anaerobic Power (Ft Lbs/sec)	Manual Resistance Field Technique	884.06	191.39	904.76	172.24	20.70		1.62[d]
	Conventional Progressive Resistance	1011.95	98.84	1078.15	94.86	66.20	18.39[a]	5.12[b,c]
	Control	943.70	118.77	946.40	122.88	2.70		.08[d]

[a]F ratio is significant at the .05 level, D.F. (2, 42).

[b]Significantly different from Control group at .05 level, D.F. (2, 42), Tukey (a) method.

[c]Significantly different from Field Technique at .05 level, D.F. (2, 42), Tukey (a) method.

[d]Significantly different from Conventional Technique at .05 level, D.F. (2, 42), Tukey (a) method.

medial maleoli. The pulling assembly was attached to a hook at the lower end of the table. Insuring measurement accuracy, the subject was cautioned to prevent flexing his arms or lifting his buttocks.

Upon obtaining data by mechanical means, raw scores representative of knee strength during flexion and extension were obtained. These scores were graduated into foot pounds utilizing the best score recorded from both legs. A mean score which was obtained for each subject from the four measures was used for statistical analyses.

A representative measurement of power at the knee joint was obtained through a modification of the Margaria Power Test (13). The subject, standing three meters directly in front of a staircase, ran up the stairs as fast as possible taking two at a time. A switchmat was situated on the second and sixth stair with a clock being started as the subject stepped on the first switchmat and stopping as he stepped on the second switchmat. The elapsed time between the second and sixth stair was recorded in hundredths of a second. Each subject performed the test three consecutive times with the best score being recorded. Scores obtained from the Margaria Power Test are a partial reflection of leg power as measured by the product of the subject's weight and the vertical distance traveled divided by the elapsed time. Scores were measured in foot pounds per second.

Results and Discussion

Reliability of strength and power measurement was determined by computation of Pearson Product-Moment correlation coefficients through a test-retest method in 15 subjects. Both the cable tensiometer and Margaria Anaerobic Power test yielded high correlations of $r = .99$.

Random assignment of subjects resulted in a substantial difference between groups in weight (conventional, $X = 173.2$ lbs; field, $X = 155.7$ lbs; control, $X = 161.5$ lbs) and consequently in strength as summarized in Table 1. In an attempt to adjust for initial differences between groups, a one-way anaylsis of covariance was employed. The difference between the posttraining value and the pretraining value was the dependent variable and the pretraining value for each of the variables was the covariate. The adjusted mean changes in both strength ($F = 9.91$) and power ($F = 18.39$) were significantly different ($P < .05$) The Tukey (a) test indicated significant differences ($p < .05$) between both the conventional and field group and the control for strength. The conventional group was found to be significantly better ($p < .05$ than both the field and control group in power changes.

Since training employed by the conventional group was characterized by a series of contractions through the full range of motion it may be considered as an isotonic training technique. Conversely, the field technique was primarily an isometric method of strength improvement. The conclusion that an isotonic and isometric training are equally effective in strength development is in substantial agreement with several earlier studies (9, 10, 17) while in disagreement with others (1, 2, 14). Perhaps the greatest difficulty involved in comparing between these techniques is the difficulty in controlling for tension produced and work done. Discrepancies in findings from various studies may reflect only that one group was training longer or with greater work loads.

The finding that isotonic strength

training was effective indevelopment of power was in agreement with earlier work by Capen (6) and Chui (7). In contrast, the isometric training utilized by the manual resistance group did not provide adequate stimulus for power improvement. Ball et al (3), McClements (25), and Start et al (20) have provided evidence supportive of the present study in this regard. These findings may be partially explained by the principle that isometric tension is at its maximum at zero velocity. Since measurement of power involves an important component of velocity, the effects of isometric strength acquisition may be minimal.

This study appears to be another practical demonstration of the principle of "specificity of training." It may be that the increase in maximum tension of the muscle is limited to a very specific angle, while muscular work at the remaining angles of motion are unchanged. It would appear that if power is a prime objective of training, progressive resistance strength training (with each contraction through the full range of motion) is the appropriate technique for athletes to select. This is not meant to imply that the coach must purchase expensive, cumbersome equipment such as that used in the present study. Bars and weights may be purchased at far less cost while offering the identical potential for power development when used in a scientifically based program. (11, 12).

Conclusions

Within the limitations of the present study it may be concluded that:

1. A field strength training technique characterized by a six second isometric contraction followed by contraction through a full range of motion is equally effective with a traditional progressive resistance strength training technique in development of strength.

2. The traditional strength training technique employed was effective in development of power while the field method was not.

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NATA ENDORSED STUDENT ATHLETIC TRAINER PROGRAMS

Date: June 28-July 2, 1976
Location: University Gym
Ball State University
Muncie, Indiana

Sponsor: Ronald A. Sendre
University Gym
Ball State University

* * * *

Date: July 12-15, 1976

Location: Higgins Hall
Western Illinois University
Macomb, Illinois 61455

Sponsor: Duke LaRue
Western Hall, University Drive
Western Illinois University

— — —

Date: August 8-11, 1976

Location: Ramsey Hall
West Chester State College
West Chester, Pennsylvania

Sponsor: Phil Donley
South Campus H & PE Center
West Chester State College

* * *

Date: June 28-July 1, 1976

Location: Wayland Hall
Wayland Academy
Beaver Dam, Wisconsin 53916

Sponsor: Gordon Stoddard
University of Wisconsin
1440 Madison Street
Madison, Wisconsin 53706

* * *

Date: June 21-24, 1976

Location: Olin Hall
Northeast Louisiana University
Monroe, Louisiana 71201

Sponsor: Charlie Martin
Northeast Louisiana University

* * *

Date: August 9-12, 1976

Location: Stetson West
360 Huntington Avenue
Northeastern University
Boston, Massachusetts 02115

Sponsor: Kerkor Kassabian
Northeastern University

* * *

Date: August 2-5, 1976

Location: West High Rise Building
North Dakota State University
Fargo, North Dakota 48102

Sponsor: Dr. Denis Isrow
North Dakota State University

* * *

Date: June 28-July 1, 1976

Location: Twin Towers East
Marshall University
Huntington, West Virginia 25715

Sponsor: Vic Winburn
Marshall University

* * *

Date: June 28-July 1, 1976

Location: Brooks-Shivers Hall
Lamar University
Beaumont, Texas 77710

Sponsor: Paul Zeek
Lamar University

* * *

Date: June 28-July 1, 1976

Location: Conference Center
Indiana State University
Terre Haute, Indiana 47809

Sponsor: Dr. Robert Behnke
Indiana State University

* * *

Date: July 12-15, 1976

Location: Twin Towers
Emporia Kansas State College
Emporia, Kansas 6680a

Sponsor: John Baxter
Emporia Kansas State College

* * *

Date: June 7-10, 1976

Location: Durrell Center
Colorado State University
Fort Collins, Colorado 80523

Sponsor: Fred Oglesby
Colorado State University

* * *

Date: July 5-8, 1976

Location: Jervey Athletic Center
Clemson University
Clemson, South Carolina 29631

Sponsor: Fred Hoover
Clemson University

Date: July 19-22, 1976

Location: Kreischer Quadrangle-Compton Hall
Bowling Green State University
Bowling Green, Ohio 43402

Sponsor: Robert Livengood
Bowling Green State University

* * *

Date: August 16-19, 1976

Location: Nicholson Pavillion
Central Washington State College
Ellensburg, Washington 98926

Sponsor: Gary L. Smith
Central Washington State College

* * *

Date: June 27-July2, 1976; July 11-17, 1976; and July 18-24, 1976

Location: Massachusetts Maritime Academy
Academy Drive
Buzzards Bay, Massachusetts 02532

Sponsor: Kerkor Kassabian
Northeastern University
Boston, Massachusetts 02115

Date: June 21-26, 1976

Location: Ruffner Hall
Emmet Street
University of Virginia
Charlottesville, Virginia 22903

Sponsor: Mr. Joe Gieck
Box 3785
Charlottesville, Virginia 22903

* * *

Date: June 20-23, 1976

Location: Maine Maritime Academy
General Delivery
Castine, Maine 04421

Sponsor: Mr. Carl Nelson
Trainer and Director of Health Services
Colby College
Waterville, Maine 04901

* * *

Date: June 28-July 2, 1976

Location: The Ohio State University
410 West Woodruff Avenue
Columbus, Ohio 43210

Sponsor: Billy A. Hill and Michael E. Bordner
Athletic Trainers
Ohio State University

* * *

Date: July 12-30, 1976

Location: Indiana State University & Union Hospital
Men's Physical Education Building
Terre Haute, Indiana 47809

Sponsor: Dr. Robert S. Behnke
110 Men's Physical Education
Indiana State University
Terre Haute, Indiana 47809

* * *

Date: June 27-July 2, 1976, July 11-16, 1976

Location: Ohio University Defiance College
Athletic Department

Sponsor: Charles Vosler
Head Athletic Trainer
Ohio University
Athens, Ohio 45701

* * *

Date: August 5-7, 1976

Location: Saint Joseph Hospital
18th and Franklin Streets
Denver, Colorado

Sponsor: Douglas E. Morton, R.P.T.
2045 Franklin Street No. 518
Denver, Colorado

Date: June 28-July 2, 1976

Location: Women's Gymnasium
East Texas State University

Sponsor: Vernon P. Eschenfelder, Jr.
Houston Baptist University
7502 Fondren Road
Houston, Texas 77036

* * *

Date: August 9-13, 1976

Location: Tully Gymnasium
Florida State University
Tallahassee, Florida 32306

Sponsor: Don Fauls
Department of Athletics
Florida State University
Tallahassee, Florida 32306

* * *

Date: August 2-6, 1976

Location: Health Service Center
360 Huntington Avenue
Northeastern University

Sponsor: Kerkor Kassabian
Northeastern University

* * *

Date: July 12-16, 1976

Location: McCowan Hall
University of Northern Colorado
Greeley, Colorado 80639

Sponsor: Dan Libera
University of North Colorado

* * *

Date: July 19-23, 1976

Location: North Athletic Facility
Ohio State Unversity
Columbus, Ohio 43210

Sponsor: Linda Daniel
Ohio State University

* * *

Date: August 16-20, 1976

Location: MacArthur Court
University of Oregon
Eugene, Oregon 97403

Sponsor: Dave E. Knoeppel
University of Oregon

* * *

Date: July 26-30, 1976

Location: Women's Gymnasium
Penn State University
University Park, PA 16802

Sponsor: Bud Miller
Penn State University

Some Principles of Physical Conditioning: Implications For The Athletic Trainer

Paul S. Fardy, Ph.D.
Case Western Reserve University

The domain of the modern-day athletic trainer has expanded considerably in recent years. Diverse activities such as fitness evaluation, physical conditioning and rehabilitation are being recognized as integral aspects in the treatment and prevention of injuries. As a consequence today's trainer should have an appreciation for and understanding of the scientific principals of physical conditioning. The purpose of this paper, therefore, is to focus upon those principals which have particular implication in athletic training.

Assistant Professor of Medicine, Department of Medicine, Case Western Reserve University; Exercise Physiologist for the National Exercise and Heart Disease Project; B.S. degree from the State University of New York, Cortland. M.S. and Ph.D. degrees from the University of Illinois, 1964 and 1967, respectively; Previously taught at California State University at Fullerton; Recipient of National Heart and Lung Institute Postdoctoral Fellowship, 1971-1972 for research on Exercise and Heart Disease at the Institute of Occupational Health, Helsinki, Finland.

Conditioning for Health and Fitness

Longevity for the average adult male in the United States has remained unchanged essentially for the last half century (15,29). This rather surprising fact is particularly disconcerting when one considers the amount of money that has been channeled into biomedical research and that mortality from infectious diseases has been virtually eliminated. Unfortunately, however, the advent of automated living and decreased physical activity characteristic of today's lifestyle has contributed to an epidemic of degenerative diseases, of which coronary artery disease is the most prevalent.

The Framingham Study found that physically inactive persons have about 1.5 to 2.0 times greater risk of coronary artery disease than persons of normal activity (20). Additional indirect evidence of increased heart disease in physically inactive individuals has been observed in numerous investigations relating occupational and leisure time physical activity to the incidence and mortality of coronary artery disease (16). Furthermore, it has been determined that the difference in the incidence of coronary events is likely to be a manifestation of the intensity of physical effort (23) and that unquestionably cardiovascular function and physical work capacity are improved with regular physical activity (17). The effect of this information has been to popularize the idea of improving health and fitness through exercise. The athletic trainer is in a position to be among those professionals assisting the public to safely attain this goal and may be called upon.

Evaluation of Function

Regular physical activity, while not a panacea, can be an adjunct to good health for the vast majority of persons. On the other hand one must not overlook the fact that there are some individuals for whom vigorous exercise is not advisable. The exercise stress test is useful in identifying the latter, while assessing functional capacity in the former. A variety of test devices and protocols have been utilized for this purpose (31) and are presented in Table 1. Of these the most informative method of

stress testing is a graduated series of workloads from submaximal to maximal effort.

Exercise Prescription

Individualized exercise prescription, as opposed to exercising en masse is a prerequisite for optimal training improvements. While individualized training is essential in adult fitness and cardiac rehabilitation programs it also has widespread application in the training of athletes. Individual sports, particularly, have made widespread utilization of individualized training according to the athlete's performance time or heart rate. Whereas team sports are not as ideally suited for individualized training, this concept can be beneficial, especially in the off-season. Each athlete should be given a separate program to follow for enhancing or maintaining fitness and for improving specific weaknesses. Improving physical condition is of special significance to the athletic trainer since the incidence of sport injuries is related to fatigue (11, 12) which is often a by-product of poor conditioning.

The exercise prescription is comprised of intensity, duration, frequency and mode of training. These factors are modified according to the level of physical condition and the purpose of the training (Table II). The prescription is based upon the results of the stress test, and reflects a percentage of maximal attainable oxygen uptake or maximal attainable heart rate. These two factors are highly related among normals, athletes and cardiacs (18).

Muscle specificity is another factor to be considered in exercise prescription. The muscle groups that will be utilized primarily should also be the principal objective of both training and testing since there is little carry-over from the training of one muscle group to another (10). Consequently, an athlete who uses mostly arms is tested more appropriately with arms as opposed to the usual testing of legs, e.g. bicycle ergometer or treadmill.

Muscle specificity, however, should not negate the concept of total fitness, especially in programs emphasizing preventive medicine. Nevertheless, many adult fitness and cardiac rehabilitation programs are based upon leg training, e.g. walking, jogging, stationary cycling. These limited programs neglect to consider that daily living requires utilizing all major muscle groups, and that ignoring the upper body musculature disregards total fitness. Bringing different muscle groups into use also applies to sport training. Since very few sports are restricted entirely to upper or lower extremities all-around fitness cannot be neglected. Alternating training activities to different muscle groups is also important as it intersperses some needed rest for the principal muscles. There are also some psychological benefits in varying activities, even though the physiological gains may be minimal.

Continuous vs Intermittent Training

Exercise training is either continuous or intermittent in nature. The argument as to which is better remains uncertain and may be rhetorical with each having advantages and the best approach probably being a combination of the two (3). Nevertheless, there are more advantages with intermittent (interval) training for most types of endurance sports. More physical work is possible in the same amount of time and the same level of work can be completed with reduced physiological demand (14). When training athletes it may be important to adhere to a strict schedule, whereas the non-trained individual training for general fitness may not adhere so strictly to a fixed program.

Additional Training Principles

Warm-up. The effects of warm-up have been well studied (19). While the literature is not in complete agreement, most research supports the concept of some type of warm-up. Circulation in the skeletal muscles is augmented by a combination of increased cardiac output and vasodilation in the peripheral vasculature. This enhances delivery of oxygen and nutritional substrates. Efficiency of muscle contractions is also enhanced as muscle viscosity decreases with the increase in muscle temperature. Increasing circulation in the coronary blood vessels is especially important in

TABLE I

MULTISTAGE EXERCISE STRESS TESTS

Name	Device	Criteria	Stages	Workload	Starting Point	Protocol
Nagle (25)	Steps	Max	2 min.	30x/min	4 cm step	C* - increase 4 cm/stage
Margaria (21)	"	Submax. HR	4-6 min.	40 cm 15x,25x/min.	40 cm (adults) 30 cm (old or child)	I** - steady state at each level predict VO_2 max from Nomogram
Denolin (13)	Leg Ergometer	Submax.to 150 HR	5 min.	150kpm/min.	150-450 kpm/min	C - extrapolate to phys.work cap. required for 170 heart rate
Binkhorst (8)	Leg Ergometer	Max.	0.5 min.	300kpm/min.	150 kpm/min	C - increase by 300 kpm/min. to exhaustion
Astrand (1)	Leg Ergometer	Submax.	6 min.	kpm 50 rpm-x min.	variable	C - to heart rate steady state; bet.130-170 - predict VO_2 max from Nomogram
Hellerstein	Leg Ergometer	Max	4 min. ex. 2 min. rest	kpm 50 rpm-x min.	150-300 kpm/min.	I - increase by 150-300/stage until maximal attainable level
Fardy	Arm Ergometer	Max	4 min. ex. 2 min. rest	kpm 60 rpm-x min.	150-300 kpm/min.	I - increase by 150-300/stage until maximal attainable level
O.Bar-Or (6)	Arm Ergometer	Max	2 min	kpm/min.	variable	C - increase by 150 kpm/min. to maximum
Mitchell (22)	Treadmill	Max	2.5 min.ex. 10 min.rest	6 mph	0% grade	I - increase by 2.5% each workload to maximum
Taylor (30)	Treadmill	Max	3 min.ex. rest to recover	7 mph	0-5.0% grade	I - increase by 2.5% each level to maximum
NEHDP (26)	Treadmill	Max	3 min.	0-26% 2-3.4 mph	2 mph - 0% grade	C - increase by 3.5% to 17.5% inc. speed to 3mph dec.grade to 12.5%; inc. by 2.5% to 20% - inc. speed to 3.4 mph and inc. grade to maximum
Balke (4)	Treadmill	Max	1 min.	3.3 mph	3.3 mph 0% grade	C - increase by 1% each minute to maximum
Bruce (9)	Treadmill	Submax. or Max.	3 min	variable	1.7 mph 10% grade	C - 3 higher stages-2.5 mph 12% 3.4 mph 14%, 4.2 mph-16%

* Continuous ** Intermittent

middle age and older adults since myocardial ischemia has been observed at the onset of of strenuous exercise without preceding warm-up (5). The ischemic response seems to be caused by increased myocardial demands from heart rate increasing more rapidly than the myocardium is supplied with oxygen (14). Ischemia in the myocardium might precipitate an attack of angina pectoris or even a myocardial infarct.

Cool down. A gradual cooling off following exercise is also indicated, especially when the demand for oxygen has exceeded the supply and has created an oxygen debt. In order to replenish the supply of energy reserves quickly and to carry off the waste by-products of metabolism efficient circulation must be maintained. This is aided by the massaging action on the veins from continued muscle contraction and relaxation following vigorous exercise. The effect is to enhance venous return and stroke volume, thereby maintaining cardiac output without a compensatory increase in heart rate.

Table II. Training Factors Modified According to Level of Physical Condition.

Level of Physical Condition	Intensity of Effort (% max HR)	Frequency of Training (days/week)	Duration of Training (mins/session)
Athletes	85-90	5-7	60-120
Untrained Normals	60-75	3-4	15-45
Trained Normals	75-85	3-5	30-60
Untrained Cardiacs	60-70	3 days	15-30
Trained Cardiacs	70-85	3-5	30-60

Environmental conditions. Physical exertion should also be modified according to environmental conditions. Increased temperature and humidity deters thermoregulation via evaporation. Vigorous exercise in these circumstances can cause a precipitous rise in body temperature which increases circulatory demands and decreases the efficiency of muscular contraction. These conditions necessitate proper salt-water balance, wearing light clothing, and interspersing exercise with sufficient breaks in a shaded area for rest and water ingestion. Unless certain precautions are taken the risk of heat illness is omnipresent. Heat stroke, in particular, is prevalent among football players who typically wear restrictive clothing, return to early fall practice in poor physical condition and are suddenly confronted with the physical demands of a grueling practice schedule. Each year, in fact, there are several deaths attributed to heat illness among young athletes (24), most of which are avoidable. The use of rubberized suits for

augmenting weight loss should also be prohibited for the same reasons. Extreme cold is also contraindicative to vigorous exercise. Lowered environmental temerature can bring about espisodes of angina in those so predisposed a well as causing respiratory tract irritation and bouts of heavy coughing. The latter can be avoided by wearing a face mask to warm the inspired air.

Proscribed Activities

Activities which could prove potentially hazardous to one's health also need to be recognized and prhibited. for example isometric exercise can be deleterious to health in older and untrained persons and therefore should be avoided. The effect of isometric contraction is to elevate blood pressure thereby increasing myocardial demands for oxygen while decreasing blood flow. Isometric training should be limited to the athlete whose goal is to increase strength in minimal time. Even for this purpose, however, it should be noted that isometric exercise increases strength only at the angle of application and does not produce a concomitant increase in muscle power or endurance (7).

Sauna or steam baths are also potentially hazardous following vigorous physical activity until sufficient time has transpired for cooling. The danger is that peripheral blood vessels, already dilated to enhance oxygen uptake by the muscles, will dilate even more. This reduces central blood flow by decreasing venous return which is further accentuated by eliminating the milking action on the veins due to cessation of muscular activity. Since stroke volume depends upon the volume of returning blood and since venous return is impeded the result could be reduced blood flow to the brain, fainting, or insufficient coronary flow, and a possible infarct.

Expected Changes from Regular Activity

Favorable changes from regular physical activity can begin to develop in about four to six weeks. This adaptation appears to be the same in females as males. Consequently, there are no reasons which female athletes cannot be expected to undergo as strenuous a training regime as male athletes while expecting the same magnitude of change to occur (28). While training improvements are apparently unaffected by sex, there is evidence to suggest that children, or adolescents can expect to achieve higher levels of fitness by having initiated training at an earlier age (31). In addition, the amount of change appears to be a function of the level of fitness. A less fit individual can expect to improve more than a fit person doing the same amount of work (30).

Summary

The purpose of this presentation has been to aid the athletic trainer in understanding some of the implications of physical conditioning. To summarize the main points:

1. Multistage exercise stress testing to maximum is the best means of evaluating cardiovascular function and developing individual exercise prescriptions.
2. And individualized exercise program is essential for optimal training effect.
3. The muscle groups which will be utilized primarily should be the principal objective of both training and testing.
4. While both continuous and intermittent (interval) training methods have beneficial results, the latter is usually better for improving endurance.

5. Adaptation to exercise begins in approximately 4 to 6 weeks. The extent of changes is unrelated to sex but is affected by age at the onset of training.

Delivered to the 1st Annual Postgraduate Athletic Trainer's Course, Rainbow Babies and Children Sports Medicine Center, University Hospitals and Case Western Reserve University, Cleveland, Ohio, July 3, 1975.

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POTPOURRI

BY
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Flexibility has recently come into greater acceptance in the athletic world. Some trainers have emphasized it for years while others have only given it lip service or totally ignored it. Now professional athletic teams are even hiring "flexibility coaches."

Traditionally gymnastics and swimming have been concerned with flexibility; however, little has been done regarding definition, principles of development, and standards. Generally, flexibility has been defined as the range of possible movement about a joint or a sequence of joints. In 1968 Holland did a review of the research regarding flexibility in which the following generalizations were made.

1. Little agreement was found in regard to limits of "normal" flexibility or in what constitutes hypo or hyper flexibility.
2. General agreement existed that flexibility is specific and that measurement of one joint cannot be used to predict range of motion of other joints.
3. There was insufficient data to generalize regarding the relationship of flexibility to age or sex.

Today many "experts" define flexibility as the range of motion that can be maintained. Warm up activities that temporarily improve range of motion due to fluid viscosity and soft tissue temperature really has little to do with proper flexibility. Most authorities feel that increased flexibility decreases the chances for injury and increases agility and athletic performance. Unfortunately, standards still have not been developed nor programs established.

Sport Personality

The Physical Fitness Research Digest has recently devoted an issue to academic and personality qualities of athletic participants. Many interesting concepts were presented; however, few were conclusive. Personality traits varies with the type of athletic endeavor involved. Male and female traits were more alike than different when compared with athletes in similar activities. It appears that athletes also have a slight upper hand in academic achievement as compared with the group of non-participants.

Strength Exercise Programs

Strength and flexibility programs have received a great deal of popularity recently. Unfortunately, many programs are devised by ill informed people whose aim is merely to increase an individual's work load. Success in sports often makes the corresponding exercise program nationally accepted, good or bad. People in athletics often copy a published exercise program entirely and never edit it to their needs. One orthopaedic surgeon has remarked that 90% of the exercises in marines' physical training program are more detrimental than helpful. Whether or not he is correct in his assessment or whether or not the marine program would be characteristic of similar programs in athletics is beside the point. It does indicate that athletic trainers must take the time to evaluate our conditioning and rehabilitation programs and insist that the exercises involved are at least not harmful to the athletes and hopefully meeting the goals of the program. It has been suggested that proper selection of exercises consider the principles of joint dynamics, the desired results, work requirements and capacities of the individual.

Proper principles of technique are as important as exercise selection. This is especially true when working with injury rehabilitation. It might be well to consider some of the following principles.

1. Utilize a full range of motion.
2. Isolate the muscle or muscle group needing rehabilitation.
3. The resistance should never be so great that athlete cannot complete the exercise.
4. The exercise should be complete slowly and under complete control.
5. The exercise should be pain free, especially at the injury site.
6. Jerky, kicking motions should be eliminated.

Knee Exercise

A recent analysis of research has indicated several areas of general agreement.

a. Imbalance in the strength of muscles activating the two knees is a contributing factor to the noncontact knee injuries of football players. Further, individuals weak in strength of these muscles are more likely to suffer such injuries.
b. Progressive resistance exercises have been used successfully to improve knee joint stability and the strength of muscles activating the knee joints of individuals recovering from knee injuries and knee surgery.
c. Progressive resistance exercise has also proven valuable in the development of strength for the prevention of knee injuries. Such exercise is needed as a supplement to the regular routines of sports practices, as athletic training per se does not produce muscular strength to the same degree as does specific strengthening exercises for this purpose.
d. The application of progressive resistance exercises for the prevention of knee injuries is especially needed when the participant has a muscular imbalance between the two knees or when the individual is muscularly weak when compared with other players.
e. Investigators in one study differentiated between noncontact and contact injuries to the knees. The noncontact injury was thought to be due more to muscular weaknesses; the contact injury, more to chance, the chance that the participant was in a position to receive a blow to his knees. This differentiation may well be important in future studies of knee stability and muscular inbalance as related to knee injuries.

Many of these conclusions will seem commonplace to many athletic trainers; however, many of these principles are either often ignored or disbelieved. A letter to the editor or myself would be welcome if anyone would care to comment on any phase of therapeutic exercise. •

CURRENT LITERATURE

BY
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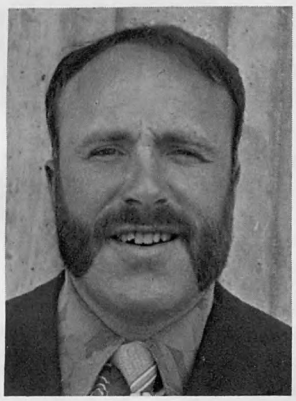
Athletic Participation and Drug Usage Among Selected High School Athletes



by Neil T. Laughlin, Ed.D.
University of San Francisco

As long as men and women have competed in sport, people have discussed or debated the value of such competition. A look at the thinking of some of the people presently interested in sport indicates that the controversy concerning the value of sport is as widespread and intense as it ever was (2). On the one hand, there are thousands of coaches and players who can be heard extolling the psychological, social, and moral benefits of athletic competition. Their credo is perhaps best epitomized by the claim that sport builds character. On the other hand, there are those who point out the abuses of athletic competition and are skeptical about its value (3, 6).

However, until recently, both advocates and opponents of athletic competition have done little to substantiate their beliefs with research. As Charles Kniker commented in a recent article which reviewed research concerning the value of athletic participation, "Neither the proponents nor the critics of athletics were able to offer substantial evidence to prove that athletics is either beneficial or harmful." (4)

Psychologists Bruce Ogilvie and Henry Tutko are two of the more prominent individuals who have tried to study the effects of athletic competition. Their results suggest that there is no empirical support for the tradition that sports build character. In fact, they claim that their findings indicate that not only does competition not seem to build character, "but it is possible that it doesn't even require much more than a minimally integrated personality." (5)

Do sports build character? This question is difficult to answer empirically. A more researchable question in the earlier stages of investigation of this issue might be: Is the behavior of athletes different when competing from when they are not competing? If research indicates it is, then physical educators and coaches can move on and attempt to specify exactly what variables in the total athletic experience are producing this behavior.

Purpose

This paper represents an attempt to examine one index of the behavior of athletes in and out of competition - their drug usage. There were two questions which the author attempted to answer:

1. Will the use of each drug surveyed in this study be significantly less in season then out of season?
2. Will the use of each drug surveyed in this study differ significantly in and out of season for junior varsity and varsity athletes, for athletes who quit a sport versus those who did not quit, for athletes who play a different number of sports, and for athletes

who are freshmen, sophomores, juniors and seniors?

Procedures

The differences between JV and varsity athletes and between athletes who quit and did not quit a sport were examined in an attempt to acquire some assessment of the influence of each subject's motivation and success in athletics on his drug usage. In an effort to make the JV-varsity variable a more valid index of the motivation and success of these athletes, wrestling was selected as the sport common to all because the league in which these individuals compete uses a challenge system each week to determine whether the athlete competes for the JV's or varsity. The author is aware that being a more motivated or successful wrestler and making the JV or varsity squad are not identical. However, the challenge system seems to be a more valid and reliable index of the motivation and success of an athlete in a given sport than the selection systems in many other sports which appear to be more dependent on the subjective opinion of the coach or the operation of many other variables.

The differences between athletes who participated in one, two, or three sports per year were examined to attempt to assess the influence that a longer athletic experience might have on drug usage. The differences between subjects who were freshmen, sophomores, juniors, and seniors were examined because year-in-school is another variable which could have considerable influence on the relationship between the experience of playing sport and the drug usage of high school athletes.

The breakdown of the subjects on the four classification variables discussed above was as follows:

1. JV/Varsity
   a. 95 JV
   b. 78 Varsity

2. Quit/No-Quit
   a. 41 quit
   b. 132 no-quit

3. Degree of participation
   a. 32 one-sport athletes
   b. 76 two-sport athletes
   c. 65 all-year athletes

4. Year-in-School
   a. 37 Freshmen
   b. 52 Sophomores
   c. 44 Juniors
   d. 40 Seniors

A 34-item inventory was administered to 173 male high school athletes during the last week of wrestling season. These athletes represent the total number of wrestlers present at practice on the day the inventory was administered. The subjects were from seven schools in the San Francisco Bay Area. The schools were in two different districts and contained good variety in scheduling of classes and socio-economic background of students.

Twenty-three questions surveyed the degree of drug usage of the students. A 6-point Likert scale was used to ask the respondents whether they had used each drug "more than once a week, once a week, once every two weeks, once a month, once a semester, or never." Nine pairs of questions measured the in and out of season usage for alcohol, upper pills, downer pills, marijuana, hallucinogens, glue, heroin, cocaine, and tobacco. Each drug surveyed contained a brief explanation. For example, the questions concerning use of stimulants other than cocaine asked, "How many times did you use an upper type of pill, e.g., Benzedrine

TABLE 1. The percentages of male athletes and students using comparable drugs at least once.

YEAR IN SCHOOL	Freshman	Soph.	Junior	Senior	Freshman	Soph.	Junior	Senior
TYPE OF USE	ATHLETES IN THIS STUDY				MALE STUDENTS IN SAN MATEO COUNTY SURVEY			
Uppers	5.4	13.3	0.0	7.5	16.9	22.8	21.8	25.8
Downers	8.1	6.7	0.0	5.0	11.9	16.0	14.7	15.4
Hallucinogens	2.7	5.8	0.0	5.0	12.2	17.6	18.0	21.2
Heroin	0.0	1.9	0.0	0.0	2.7	4.0	3.8	4.6
Tobacco	8.1	16.3	2.3	10.0	55.5	54.4	53.1	54.5
Alcohol	56.8	75.0	63.6	85.0	75.8	81.7	84.0	87.5
Marijuana	27.1	32.7	22.7	32.8	43.9	51.9	58.0	60.8

(bennies) or Dexedrine (dexies) or Methadrine (speed)?" Two questions attempted to determine the in and out of season frequency with which drugs were injected to enhance performance. Other questions inquired about the subjects' age, ethnic origin, whether they wrestled on the JV or varsity squad, whether they quit a sport, what sports they played or intended to play during the school year, and how they rated their wrestling coach.

Four procedures were followed in an attempt to establish the reliability and validity of the subjects' responses. First, subjects were assured that their answers would be confidential. The person who administered the inventory emphasized that the subjects were-*not* to put their names on the inventories, that no coach or school administrator would be allowed to see the results, that their responses would not be compared with those of any other school, and that all the schools in their league were being surveyed. Second, coaches were removed from the room while the subjects answered the questionnaire. Third, the inventories were administered by an individual who did not know the subjects and had no connection with any of the school. Fourth, the subjects were separated about five feet from one another in an attempt to preclude faking which could be caused by the knowledge that one of their teammates could see their answers.

The relationship between the total sample and each classification variable and the in and out of season use of each drug surveyed where examined by ANOVA. Computer program BMDOIIV was used to effect the ANOVA and orthogonal questions were employed to test the differences between the mean for seniors and the average mean for freshmen, sophomores and the mean for juniors; and between the mean for sophomores and the mean for juniors.

TABLE 2. The percentages of subjects using alcohol who wrestled JV's or varsity, quit or did not quit, and participated in one, two, or three sports.

TYPE OF USE	JV	Varsity	Quit a Sport	Did Not Quit	1 Sport	2 Sports	3 Sports
User In and Out of Season	52	56	71	49	50	53	57
Non-User In and Out of Season	34	24	17	33	28	28	32
User Out, but not In Season	8	17	5	14	9	17	8
User In, but not Out of Season	6	3	7	4	13	2	3
User at Some Time	66	76	83	67	72	72	68

TABLE 3. The percentages of subjects using marijuana who wrestled JV's or varsity, quit or did not quit, and participated in one, two, or three sports.

TYPE OF USE	JV	Varsity	Quit A Sport	Did Not Quit	1 Sport	2 Sports	3 Sports
User In and Out of Season	29	17	39	17	28	21	23
Non-User In and Out of Season	66	77	52	78	59	75	72
User Out, but not In Season	3	6	7	4	10	3	5
User In, but not Out of Season	2	0	2	1	3	1	0
User At Some Time	34	23	48	22	41	25	28

Results and Discussion

1. The in and out of season drug usage of the total sample of athletes did not differ significantly when each drug was examined separately.

2. The use of each drug examined in this research also did not significantly differ in or out of season whether an athlete wrestled JV's or varsity, quit or did not quit a sport, or participated in one, two, or three sports. These results give some indication that the experience of sport has little relationship with the behavior of athletes. The second result may also indicate that Ogilvie and Tutko are not completely correct when they contend that personality traits which emanate from the selection process which athletes undergo are responsible for their success in and out of sport. If "...success - in sport or elsewhere - only comes to those who already are mentally fit, resilient and strong" (5), then one might expect some aspects of the drug usage of athletes who are JV's, quit a sport, and participate in less sports to be significantly higher than the drug usage of athletes who are varsity, do not quit a sport, and participate in more sports.

On the other hand, it can be argued that it is not surprising that there was no significant difference in drug

usage between those subjects who wrestled JV's or varsity, quit or did not quit a sport, and participated in one, two, or three sports because differences attributable to JV and varsity athletes, athletes who participate in one, two, or three sports may be minimal when compared with the myriad other variables which influence their lives while in school and thus have little chance of significantly influencing their drug use.

3. The year-in-school classification variable showed a significant relationship with the drug usage of subjects in this study. The frequency of out of season usage of alcohol by seniors was significantly greater than the average mean usage of freshmen, sophomores, and juniors. (Table 1) The data indicates that freshmen, sophomores, and juniors did not differ much in their versus out of season use of alcohol, but seniors showed a marked increase during out of season as opposed to in season use. This may indicate that when the athlete knows he may never play again, as is often the case with seniors, sport ceases to have an impact on his behavior. The data also indicates that alcohol was the only drug in this study which was used with much frequency. This fact and the fact that alcohol use was the only variable which was significantly influenced by any of the classification variables might suggest that when a particular behavior (e.g., drug use) is not manifested by most subjects, then participation in athletics has little or no impact.

4. The subjects in this study use upper, downers, hallucinogens, heroin, and tobacco very infrequently - both in and out of season. Most subjects reported never using these drugs and most users reported using once a semester or once a month. If the percentage of subjects in this study using these drugs is compared with the percentage of use for male secondary students in the county where the subjects go to school (1), one can see that the drug usage of these athletes can, indeed be termed minimal. (Table 1) The high drug usage by the sophomore athletes, when compared with the other classes in this study, is interesting since this pattern does not appear with any drug in the San Mateo County Survey (1) where rates tend to increase consistenly with year-in-school. Peer pressures may exist in the athletic environment which somehow encourage experimentation among sophomores who establish friendships and relationships as a result of belonging to a team.

Alcohol and marijuana are the two drugs used most often by the athletes in this study. As was the case with uppers, downers, heroin, tobacco, and hallucinogens, the percentage of subjects using alcohol or marijuana is considerably less than that manifested by students in the San Mateo County Survey. (Table 1)

6. The percentage of athletes using alcohol and marijuana varies with whether an athletes wrestled JV's or varsity, quit or did not quit a sport, or participated in one, two, or three sports. There are smaller percentages of JV athletes who use alcohol than varsity athletes. (Table 2) This might be occurring because 67% of the JV's were freshmen or sophomores and these two classes used considerably less alcohol than juniors and seniors. Also there are considerably greater percentages of quitters using alcohol than non-quitters. The use of alcohol by fewer JV than varsity athletes varies from the pattern found with athletes who participated in one, two, or three sports where the differences are very small and seem to have no trend.

It is interesting to note that there is greater percentage of athletes who wrestled varsity, did not quit, and participated in two sports who use alcohol out of season, but not in season than those who wrestled JV-s quit, or participate in one of three sports. Perhaps sport does have some impact on those who are more successful in it, more disposed to stick with it, and participate in it for about half a year. The comparatively lower percentage of three-sport athletes using alcohol out of season as opposed to in season might be attributable to a tendency for year-long participation to be too long a period for abstinence in season.

7. As with alcohol, there are considerable higher percentages of athletes who quit a sport who use marijuana than those who did not quit. (Table 3) However, unlike alcohol greater percentages of JV athletes use marijuana than varsity athletes. Finally there are greater percentages of athletes who participated in one sport who tend to use marijuana than those who particpated in two or three sports.

Since the differences between the percentages of quitters and non-quitters are rather large for *both*- alcohol and marijuana, this variable should be examined more closely in future research. The fact that more athletes who quit a sport use alcohol and marijuana than non-quitters may be evidence that Ogilvie and Tutko are correct when they argue that it is a ruthless selection process that accounts for the "character-building" aspects of successful athletes. The fact that a greater number of athletes who participate in one sport use more marijuana than those who participate in two or three sports may suggest that athletics has potential benefits for those participants who play at least one half of the school year.

Conclusion

Since year-in-school was the only variable which showed a significant relationship with any of the drugs examined in this research, any conclusions regarding the in and out of season behavior of these athletes must be approached with caution. Just as success and failure in sport may influence behavior in other aspects of an athlete's life, success and failure in other aspects of life may influence an athlete's behavior in sport. The dynamics of the relationship between playing sport and the drug usage of athletes in and out of season needs to be examined in further research to attempt to determine what variables inside and outside sport are most important in influencing the behavior of athletes.

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Announcements

Dear NATA Members:

The A-V committee has been accumualting a list of the various materials available to our membership with the intention of publishing a bibliography and making it available to our organization.

If any members know of resource listings, films, cassette recordings or other similar materials it would help in our search for new avenues to explore and eventually list in the the publication.

Please have the members who wish to respond, send the information to the committee member nearest his own location.

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See you in Boston.

Sincerely,
Bob Burkardt

MEMORIAL

James H. Morris, 62, Athletic Trainer at Butler University for 30 years, died on March 27, 1976 in St. Vincent Hospital, Indianapolis, Indiana.

Jim was a founder of the National Athletic Trainers Association, and in 1969 was named to the Helms Athletic Trainers Hall of Fame. He also entered the Indiana Basketball Hall of Fame in 1968 and the Indiana Football Hall of Fame on January 17, 1976.

He is survived by his widow, Mrs. Helen Morris; two daughters, Kathy and Judy Morris; and a son, David Morris. Our most sincere sympathies go out to them. We have lost one of our finest.

"DOC" LINSKEY RECEIVES AWARD

The Massachusetts Football Coaches Association gave its Distinguished Service Award to William Francis Xavier (Doc) Linskey, 61, Head Athletic Trainer of the Cambridge School Department. "Doc" is the first trainer so honored.

"Doc" graduated from Massachusetts School of Physio-Therapy in 1937. He worked with the Boston Olympics Hockey Team 1937-46; Northeastern's Football and Basketball Teams 1939-43; and the 1959 U.S. Pan American Games.

In addition to serving on numerous N.A.T.A. Committees, "Doc" has been the Secretary-Treasurer for E.A.T.A. Our sincere congratulations to "Doc" for a most deserving award.

May 14, 1976

Dear Members:

I take great pleasure in announcing the reelection of Frank George to the office of President of the National Athletic Trainers Association.

Respectfully,
Otho Davis

CALENDAR OF COMING EVENTS

by
JEFF FAIR, A.T.,C.
OKLAHOMA STATE UNIVERSITY

JULY 5-9
Comprehensive Lecture on General Sports Medicine, Institute of Sports Medicine and Athletic Trauma (Lenox Hill Hospital), International Federation of Sports Medicine, American College of Sports Medicine: Americana Hotel, New York City. Contact James A. Nicholas, M.D., 130 East 77th Street, New York, New York, 10021.

10-16
29th Annual American Corrective Therapy Association Conference and Workshop: Happy Dolphin Inn, St. Petersburg, Florida. Contact Bruce K. Martin, P.O. Box 4044, Bay Pines, Florida, 33504.

11-14
Meeting of the American Orthopaedic Society for Sports Medicine: Tamarron, Durango, Colorado. Contact Robert L. Larson, M.D., Program Committee - AOSSM, 750 East Eleventh Avenue, Eugene, Oregon, 97401.

11-16
International Congress of Physical Activity Sciences - 1976: Quebec City, Quebec, Canada. Contact the Executive Secretary, The Internaitonal Congress of Physical Activity Science - 1976, P.O. Box 1976, Quebec City, Quebec, Canada G1K7M1.

12
Three consecutive one week post-graduate sports medicine workships for one semester graduate credit and of independent content: Indiana State University, Terre Haute, Indiana. Contact Dr. Robert S. Behnke, Workshop Coordinator, 110 Physical Education Building, Indiana State University, Terre Haute, Indiana, 47809.

July 24-29
July 31-Aug. 5
Two weekly sessions of the Miami University Sports Medicine Workshop will be held for student trainers. For further information contact Ken Wolfert, Millett Hall, Miami University, Oxford Ohio 45056.

AUGUST 6-7
A course on the Medical Aspects of Sports will be offered at The University of Tennessee. For details communicate with Division of Continuing Education, UTCHS, 800 Madison Avenue, Memphis, Tennessee 38163

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N.A.T.A. Certification Examination: Terre Haute, Indiana and West Chester, Pennsylvania. Contact N.A.T.A. Board of Certification, Post Office Box X18, Ann Arbor, Michigan, 48107. •

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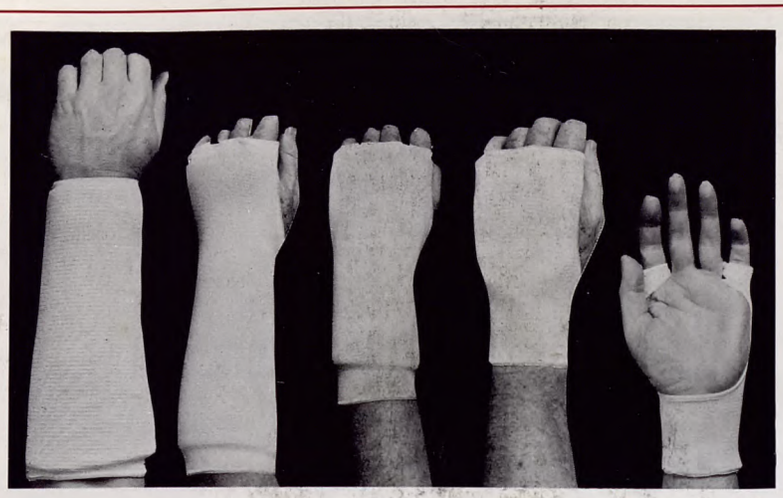

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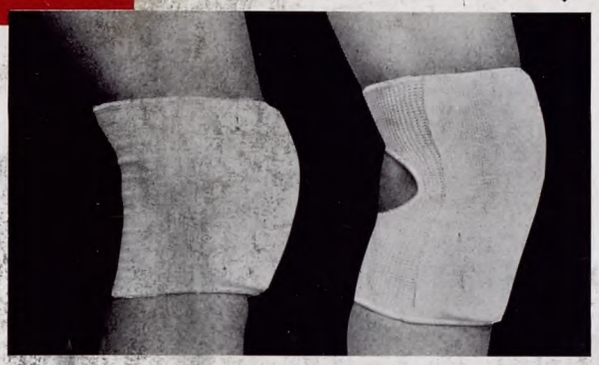

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