

ATHLETIC TRAINING

THE JOURNAL OF THE NATIONAL ATHLETIC TRAINERS' ASSOCIATION, INC. • VOLUME 26 • NUMBER 2 • SUMMER 1991



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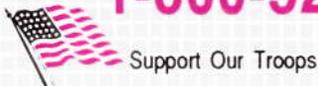
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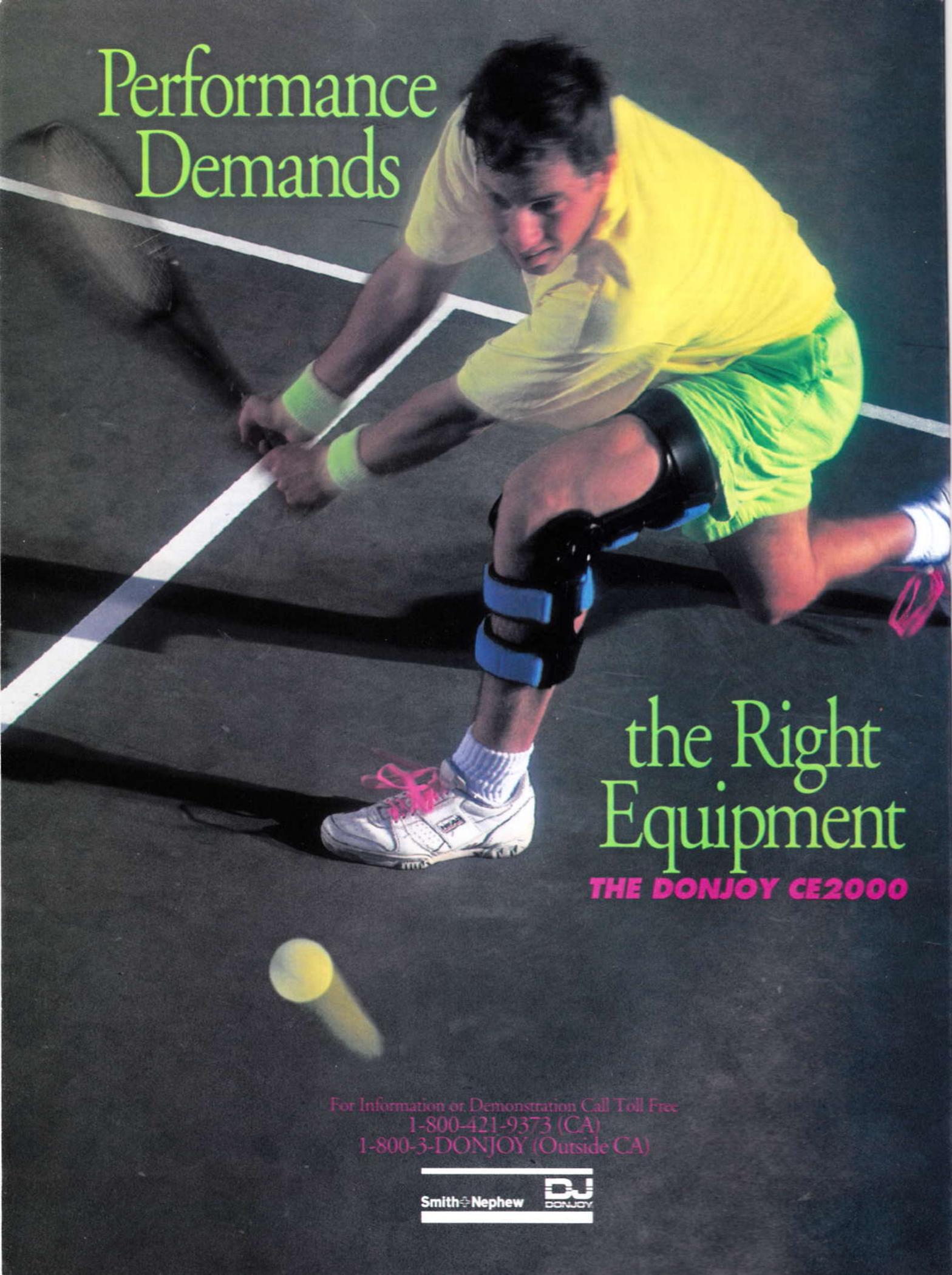
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Editor-in-Chief's Comments



Steve Yates, MEd, ATC
Wake Forest University
Winston-Salem, NC 27109

Thanks

In the summer of 1983 I accepted the role of Editor-in-Chief of *Athletic Training, JNATA*. Now, after eight years, I am grateful and honored to have served this organization and to have chaired the Committee responsible for its printed periodical.

I feel this *Journal* has evolved into a respected publication in the allied health community during my tenure. I feel that the time has come (as in any organization) for a change in leadership, which is necessary for a new era to begin.

I am officially resigning as Editor-in-Chief upon the completion of this *Journal*. I feel it is in the best interest for myself, my family, and for the *Journal*.

My relationship with the Board of Directors, Presidents, and the general membership has been both remarkable and fulfilling.

Lastly, I would like to thank my family for showing patience and understanding in my pursuit of a personal, as well as professional, goal.

(SSSA)

Letters to the Editor

I read the paper on *Incidence and Severity of High School Athletic Injuries* by Whieldon and Cerny in the Winter 1990 issue of *Athletic Training, JNATA* this week. This is an interesting study, and certainly there is a need for continued evaluation at the high school level. However, I must comment on several conclusions that were reached in the article.

I understand that part of the motivation for this investigation was to justify certified athletic trainers at the secondary school level. Common sense tells us that this will relieve coaches of the responsibility for the assessment of injury if we provide educated protection of the athlete. However, I don't believe this data can be used to support the cost-effectiveness of a certified athletic trainer at the high school level. Eighty-three percent of these injuries at both the varsity and junior varsity level, were either non-reportable or minor. The real injury rate for moderate, major, and severe groups, which are the usual groups considered in an injury study, was 15 per 100 per season.

Furthermore, in most places in this country, there is an inadequate number of certified athletic trainers to fulfill the need. I think that the NATA and this journal would be better motivated to attempt to find a way to provide such input at the high school level through some other mechanism. An educational program for faculty who donate their time at the high school level may provide for a need that has existed for 30 to 40 years. I urge the NATA to look at alternatives. While the ideal may be to have a certified athletic trainer in every high school, reality is that an alternative is needed to provide a more immediate solution to the problem.

Thank you for your continued work in this area.

William A. Grana, MD
Oklahoma City, OK

We thank Dr. Grana for his interest in our data. In response to Dr. Grana's comments, we need to state categorically that the purpose of our investigation was not "to justify certified athletic trainers at the secondary school level," nor to "support the cost-effectiveness of a certified athletic trainer at the high school level." Such justifications have no place in scientific research.

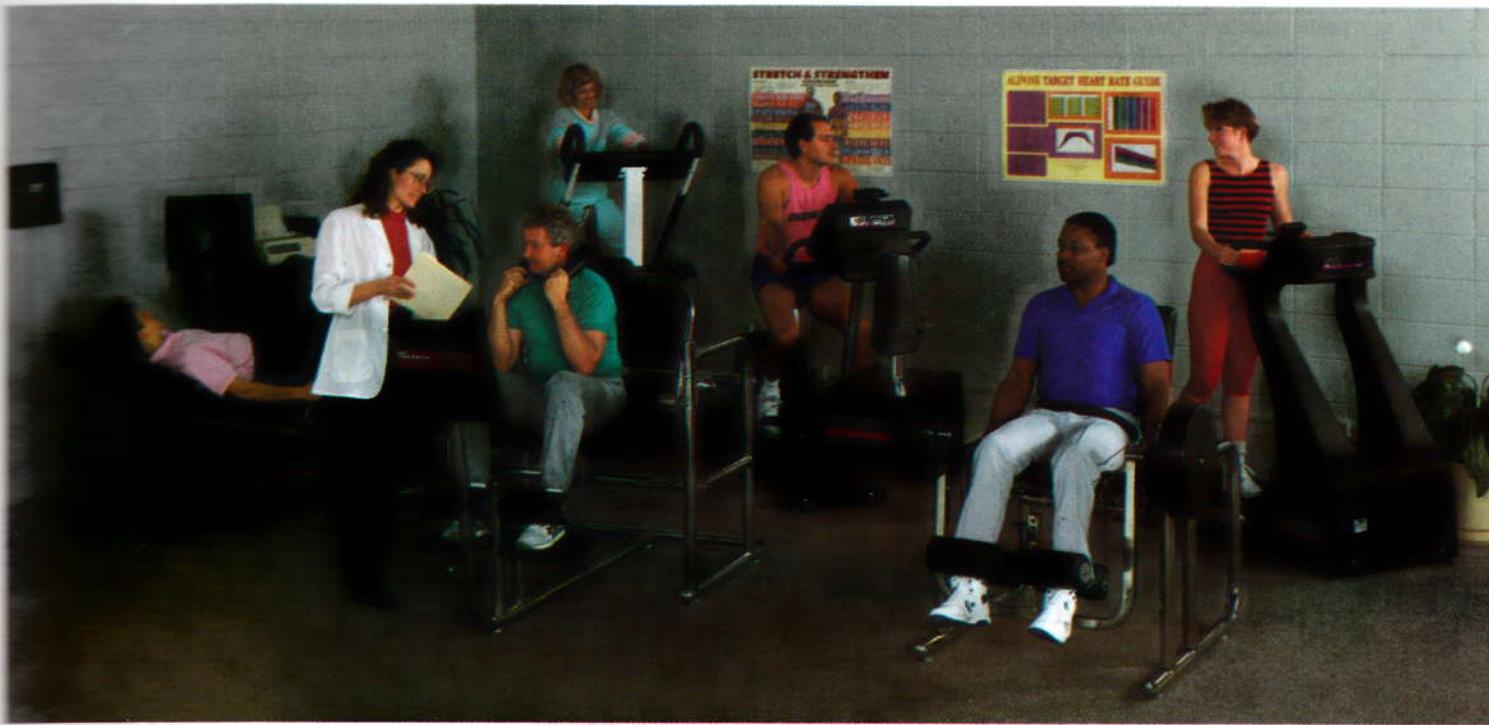
As stated in the first paragraph, these data were collected based on our interest in identifying injury incidence, using appropriate epidemiological techniques, to allow judicious use of medical resources at the secondary school level. As stated in our paper, and confirmed by Dr. Grana, it is not feasible to require physicians, or even athletic trainers at all venues. To ensure that whatever medical coverage is available, however, administrators should be informed of the probability of injury in making placement decisions. Our data provides such information.

We are not sure why Dr. Grana does not consider non-reportable or minor injuries as "real" injuries. Those of us working with athletes on a daily basis would be remiss in our responsibilities if we ignored these injuries. Again, as stated in our paper, while our data can not prove the hypotheses, our experience during and since this study suggests that when minor injuries are cared for immediately and appropriately, the possibility of exacerbating the injury and time lost seem to be minimized.

Thank you for the opportunity to address these important issues.

Terry Whieldon, MS, RPT, ATC
Frank Cerny, PhD, FACSM

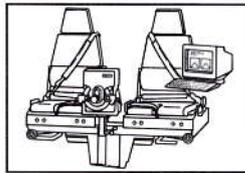
I commend the National Athletic Trainers' Association for gaining formal recognition of athletic training education as an allied health profession by the American Medical Association. The AMA's resolution will certainly have a positive effect on the way that athletic trainers are perceived by the medical community. At the Bowman Gray School of Medicine, we established a Sports Medicine Unit in 1980 in coordination with Dr. Eugene Hooks, Director of Athletics, to provide health care for Wake Forest University intercolle-



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giate athletes. Our athletic trainers have been a vital part of the success of the Sports Medicine Unit.

The AMA took a very positive step to include Athletic Training Education Programs in the allied health professions and to require certification by the AMA's Committee on Allied Health Education and Accreditation.

Congratulations on this outstanding accomplishment.

Richard Janeway, MD
Executive Vice President for Health Affairs
Executive Dean, The Bowman Gray School of Medicine
Wake Forest University
Winston-Salem, NC

I have been putting off this very pleasant task for far too long. In my most recent issue of *Athletic Training, JNATA*, Spring 1991, I am reminded that I can no longer delay this process.

I want to thank you and your editorial board for progressively making our journal one of the really fine sports medicine information sources. I know this has been a long, slow, arduous process, but you have done very well in not only presenting good information, but in encouraging so many of our reticent writers within the profession to express themselves in writing and to make it available in print to share with the entire profession.

I know how much personal time and emotion it takes to do the kind of job you are trying to do, and I just wanted to let you know how well I think you are doing it, and how much I appreciate the professional impact of your work. I hope the rest of the profession, in particular the Board of Directors, appreciates your work as much as most of us in the field do.

Phillip B. Donley, MS, PT, ATC
Chester County Orthopaedic & Sports Physical Therapy
West Chester, PA

The following synopsis was printed in Potpourri, *Athletic Training, JNATA* 26(4), p. 89, 1991:

Knowledge Best Defense Against Health Fraud
Food & Nutrition News

Fast Scan: Health fraud is big business. It can delay a patient's entry into the legitimate health care system, and can cause serious bodily harm. In

addition, it can mesmerize people into thinking they are practicing good health care habits.

Many of these fraudulent health schemes involve dubious diagnostic tests; phony weight loss gimmicks; unnecessary nutrition and supplements; other nutrition related "ideas" and "miracle cures"; and treatment for cancer, AIDS, arthritis, and many other diseases.

It is very important for both professionals and lay public to understand quackery's scope and the techniques quacks use to defraud health consumers.

Knowledge is the best defense against health fraud.

I agree that knowledge is the best defense against health fraud, and, as allied health professionals, it is our responsibility to educate and pro-actively work against this health fraud.

I recently attended the Great Lakes Athletic Trainers' Association district meeting. As I walked through the exhibitors' hall, I stopped to talk to a vendor about his product, which happened to be a nutrition supplement. He said that after taking this product, individuals claimed to get relief from a variety of illnesses, including Lyme's Disease and arthritis. He also stated that the leading health problems in our society, such as heart disease, diabetes, and cancer, are nutrition-related; therefore, by taking this product a person improves his or her nutrition and prevents disease. I then asked him how a vitamin supplement could help a person eat less fat. He did not understand what I meant.

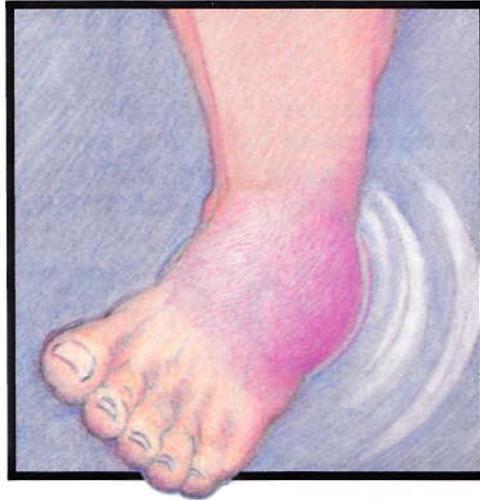
The salesman admitted that he did not have any formal training in the area of nutrition. He was a computer analyst and his partner was an accountant. They were selling the product because they "believed" in it.

It is very true that poor nutrition practices in our society today contribute to major illnesses, but to have unqualified individuals selling products based on testimonials and misleading the general public only compounds the problem. The fact that we allow these individuals to promote their products at our symposiums is outrageous.

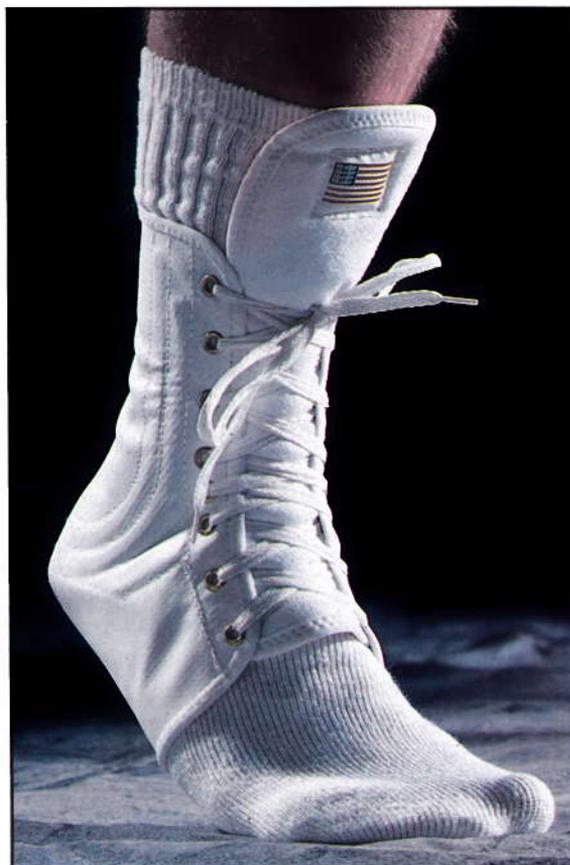
I hope in the future we can be more discriminant and choose vendors who parallel our philosophy of professionalism in the area of health promotion.

Kathy Campisi Freeman, MS, ATC
Exercise Physiologist
Tinley Park, IL

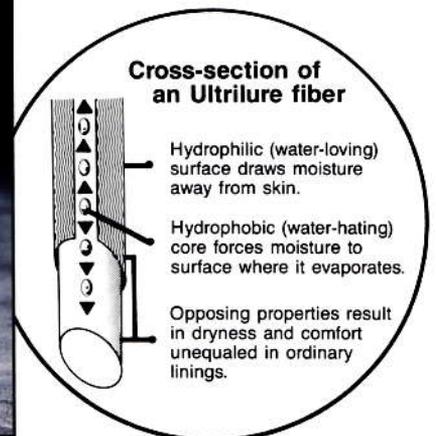
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Editorial

New, New, New, and Thanks for the Old

Kenneth L. Knight, PhD, ATC

There have been dramatic changes in *The Journal* during this past year; changes that Steve, Barb, and I have planned for the last three to four years. Many of you have commented that you like the "new look". In the process, our mission changed, our goals sharpened, and Steve's job was eliminated.

In the past, *The Journal* was the sole means of print communication within the NATA. So almost 50% of its content was association business; i.e., committee reports, letters from the president and other officers, minutes of the board of directors meetings, certification exam dates, etc. *The Journal* had to be all things to all people.

But the *NATA News* is now established and has assumed part of the mission of *The Journal*. The *NATA News* now carries association business. With this shift, *The Journal* can concentrate on what is the primary role of most professional journals: to expand the profession's body of knowledge and to share this knowledge with members of the profession. A secondary role is to promote internal and external public relations.

The role delineation study has defined our profession, and is the guide for what we publish in *The Journal*. The 174 knowledges and 135 skills of the role delineation study define what a person must know and be able to do in order to perform the 37 tasks of the athletic training profession. So the mission of *The Journal* is to expand the breadth and depth of theoretical and practical knowledge related to those skills and techniques.

One of our goals is to publish an equal number of research, literature review, and in-depth technique articles, while continuing to publish some tips and case studies. Another goal is to slant the majority of our articles toward the certified athletic trainer practicing the art and science of athletic training. A lesser number of articles will be simpler and will appeal to students and neophytes, while some will be more complex and therefore, appeal to those with advanced education and interests.

We hope to continue to increase the number of athletic trainers who are the primary authors of manuscripts. We will continue to develop more helps for authors so that more people will feel comfortable enough to share their ideas. As the quality of writing among NATA members increases, the stature and prestige of *The Journal* will increase, and the stature and recognition of our profession among other allied health professions will increase.

Many NATA officers and members have voiced a desire to have *The Journal* indexed in *Index Medicus*. This is not a good idea, as we would have to give up too much to be included. We are, however, indexed in the *Physical Education Index* and the *Sport Data Base* of the Sport Information Resource Center of Canada.

Although *Index Medicus* is more prestigious, it only indexes journals in which articles are mostly research. We want to be more than a research journal.

Enough about our mission and goals. What next? Beginning with Volume 27, we will have a new name...*The Journal of Athletic Training*. Both *Athletic Training*, *The Journal of the National Athletic Trainers' Association* and *Athletic Training*, *JNATA* are too long. Just plain *Athletic Training* is too confusing. This publication is not athletic training, the profession is. Most of us refer to this publication as "*The Journal*" in order to avoid the confusion between its real name and the profession. Many professions call their official journal "*The Journal of...*" And there are almost no journals whose name is the same as the profession. We are now in line with the overwhelming majority.

Why did we choose *The Journal of Athletic Training* rather than *The Journal of the National Athletic Trainers' Association*? For two reasons. One is that the latter is too long and cumbersome. But more importantly, as discussed above, we want to become more than a journal for our association. We want to become the definitive source for sports injury management. We will continue to be an official publication of the NATA, and our primary audience is NATA members. But we hope to appeal to increasing numbers of other health care professionals who deal with sports injuries.

You should already have noticed a new masthead page. We continue to streamline the introductory material. We tried to make the Guide to Contributors page more readable and to give better instructions to potential authors. These are part of our continuing effort to clean up the appearance of *The Journal*.

We hope these changes will increase the reputation of *The Journal*, both within and outside of the NATA. We want our members, physicians, and other allied health professionals to think of the *Journal of Athletic Training* as the best source of information concerning sports injury management. And we want athletic trainers to look to the *Journal of Athletic Training* as their first choice for publishing their best work.

And as we move forward, let's not forget where we have been, and who got us to where we are. Much of Steve's job was coordinating the efforts of many departmental editors. Most of those departments are now part of the *NATA News*. And as we have moved *The Journal* into the electronic age and desktop publishing, Barbara's job has been eliminated. Only those who have been on the "inside" can truly appreciate their dedicated and devoted service. Thanks Steve for eight years of devoted service, and Barbara for keeping things running for 14 years. We owe you much.

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Eating Disorders— The Role of the Athletic Trainer

Ann C. Grandjean, EdD, RD

ABSTRACT: During the past decade, an increase in the prevalence of anorexia nervosa and bulimia nervosa has emerged, resulting in a greater understanding of the etiology, pathology, and treatment of these eating disorders. The exact occurrence in athletes is not well-defined, but it appears to occur more frequently in sports that emphasize thinness. Athletic trainers, coaches, and others working closely with athletes should be knowledgeable about eating disorders, know how to identify the symptoms, and be prepared to manage problems that may arise. This paper discusses the role of the athletic trainer in helping reduce the risk of eating disorders and in establishing a plan to manage problems, should they occur.

Eating disorders are not a new phenomenon. Literary accounts of self-inflicted starvation and weight loss date back to the Middle Ages. Accounts of emphasis on slimness in Ancient Egypt, Greece, and Rome also can be found. The Romans are known for designing the vomitorium, a site where vomiting was used as a method of weight control after gorging (7,28).

What is new is a greater awareness of eating disorders among athletes. Studies indicate that eating disorders occur more frequently in athletes who participate in sports such as gymnastics, figure skating, wrestling, and ballet, where weight and/or body fat restrictions are imposed (6,9,10,23,25,27). Eating disorders, however, are not limited just to sports that emphasize leanness. Pathogenic weight-control practices have also been noted in young competitive swimmers (4,13).

PREVALENCE IN THE GENERAL POPULATION

It is estimated that anorexia nervosa occurs as often as once per hundred persons in a vulnerable population, such as female high school or college students (19). Bulimia nervosa, now the most common eating disorder, reportedly occurs in as many as four to five percent of female college freshmen (2). However, estimates of the prevalence of eating disorders vary widely, depending on the diagnostic criteria used (26). Although anorexia nervosa and bulimia nervosa are usually considered disorders of young women and girls, five to ten percent of cases occur in men and young boys (3).

EATING DISORDERS IN ATHLETES AND DANCERS

Among a group of college athletes and nonathletes, Borgen and Corbin (6) found that 20% of the students participating in sports and activities that emphasize leanness (ballet, body building, cheerleading, and gymnastics) were exceptionally preoccupied with weight, or had tendencies toward eating disorders, compared with 10% of the total population of athletes studied. Another study of female college athletes showed that 32% practiced at least one pathogenic weight control behavior (24).

Ballet Dancers

Several reports have suggested an increase in the prevalence of anorexia and bulimia among female dancers. Brooks-Gunn et al. (9) surveyed dancers performing in national and regional ballet companies in the U.S. and Western Europe, and found that 33% suffered from eating problems. Thirty-three percent (33%) of the female university dancers studied by Evers (14) were at risk for symptoms of anorexia nervosa. Garner and Garfinkel (16) found that 6.5% of the professional dance school students surveyed had primary anorexia nervosa and that all but one of these subjects had developed

Ann Grandjean is Director, International Center for Sports Nutrition, 502 South 44th Street, Suite 3012, Omaha, NE 68105.

anorexia nervosa after beginning to study dance.

Data by Kurtzman et al. (20) demonstrated that, overall, dancers reported the highest prevalence of anorexia nervosa symptoms (27%) when compared to other groups of university female students. According to a study by Hamilton et al. (17), "audition" ballet companies showed a significantly higher incidence of eating problems than highly selective dance groups (46% vs. 17%).

Brooks-Gunn et al. (8) compared female dancers, figure skaters, and swimmers with regard to weight and attitudes about eating. The ballet dancers exhibited more restraint when eating than skaters or swimmers did, which the authors attributed to the low weights required by their profession.

One of the diagnostic criteria for anorexia nervosa is amenorrhea (Table 1). A high incidence of amenorrhea and irregular menstrual cycles has been demonstrated in ballet dancers (11,12). Benson et al. (5) reported that 33% of university and professional dancers studied experienced abnormal or absent cycles. Another study of 89 young professional ballet dancers found that 15% reported secondary amenorrhea, and 30% reported irregular cycles (15). Menstrual abnormalities, however, can occur in female athletes at all levels of competition and may be reflective of genetics as well as environmental factors (17).

Table 1. Diagnostic criteria for anorexia nervosa and bulimia

Anorexia Nervosa

- Refusal to maintain body weight over a minimal normal weight for age and height (For example, the athlete works to keep his or her weight 15% below the target weight, so growth doesn't occur as expected during childhood or teen years, which results in a body weight 15% below average.)
- Intense fear of becoming obese, even when underweight
- Inability to accurately see one's body weight, size or shape (In other words, the person claims to feel fat even when emaciated.) Belief that one area of the body is too fat even when the person is obviously underweight
- Absence of at least three menstrual cycles in a row

Bulimia

- Binge-eating (Binge-eating is the hurried eating of large amounts of food usually in less than two hours.)
- Fear of not being able to stop eating during binges
- Regularly engaging in either self-induced vomiting, use of laxatives, or rigorous dieting or fasting in order to get rid of the food or the calories from the food eaten during binge-eating
- At least two binge-eating sessions per week for at least three months

Female Gymnasts

Female gymnasts also have been identified as a group that may be at particularly high risk for developing eating disorders (10). In gymnastics, there is a constant desire to be thin and aesthetically appealing (22,23). Rosen and Hough (23) evaluated the weight control practices of 42 female college gymnasts by using the Michigan State University (MSU) Weight Control Survey. This diagnostic tool was developed especially for use with athletes to identify factors associated

with the use of pathogenic weight control behaviors. Rosen and Hough found that the gymnasts in their study were all dieting, either to enhance athletic performance or to improve appearance. Of the total group, 26 (62%) were practicing at least one form of pathogenic weight control, such as diet pills, self-induced vomiting, or fasting. On the contrary, Benson et al. (4) recently reported that female gymnasts exhibited fewer (1%) tendencies toward eating disorders than female swimmers (11%).

Female Swimmers and Distance Runners

Female swimmers and distance runners also have been surveyed for possible eating problems. Dummer et al. (13) found that young competitive swimmers had misperceptions about their weights, which the authors believed were related to societal influences rather than the demands of their sport. As mentioned previously, Benson et al. (4) reported that swimmers had greater tendencies toward eating disorders (11%) than gymnasts (1%). Weight and Noakes (29) concluded that the incidence of anorexia nervosa is no more common among competitive female runners than it is among the general population. However, elite runners are more likely than non-elite runners to exhibit the physical and psychological features of anorexia.

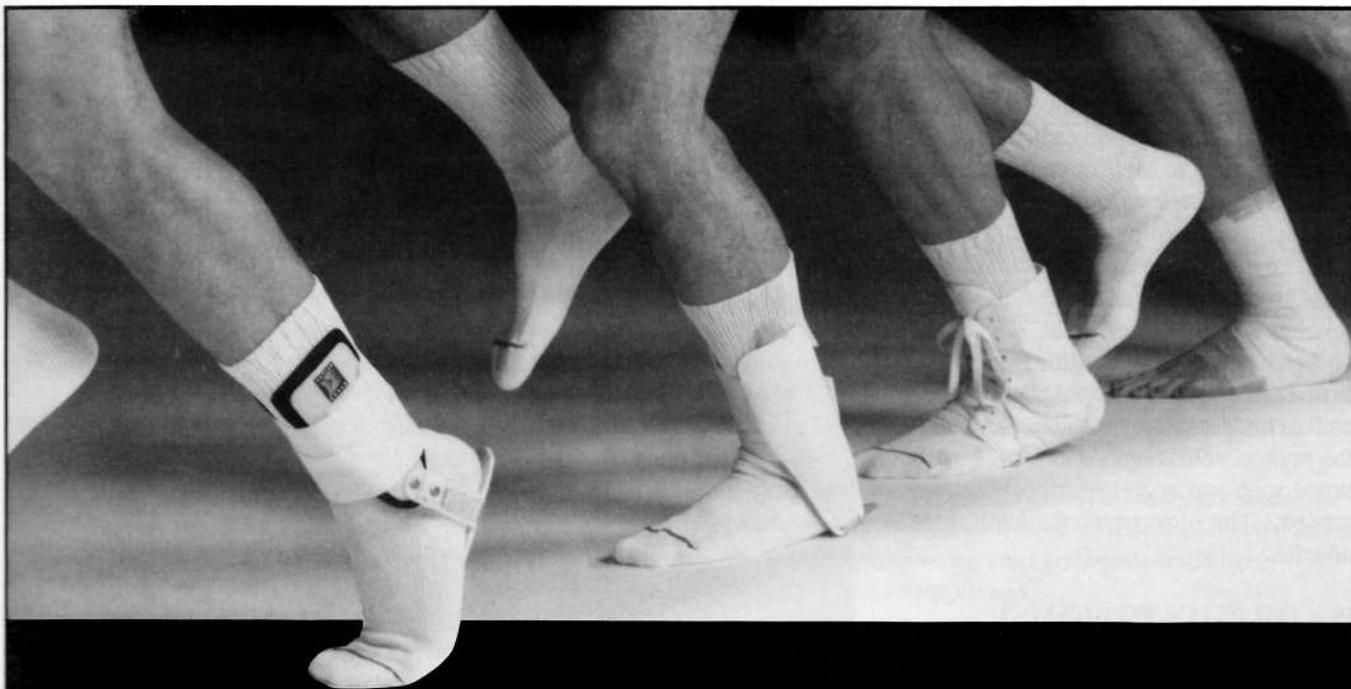
To summarize, it appears from the studies reviewed that some groups of athletes are at risk for eating disorder problems. The question is, are eating disorders becoming more prevalent or is the identification of such disorders increasing (18)? Schotte and Stunkard (26) believe that the prevalence of eating disorder-related symptoms is considerably higher than the prevalence of eating disorders. They conducted a study of 1965 university students and found that although bulimic behaviors (binge-eating, self-induced vomiting) were common among college women, clinically significant bulimia, as described in the *Diagnostic Statistical Manual of Mental Disorders (DSM-III)*, is not.

The key is learning to distinguish between persons with eating disorders and those whose behaviors only mimic eating disorders.

HOW TO IDENTIFY AN ATHLETE WITH AN EATING DISORDER

There is a distinct difference between being thin and having anorexia nervosa, as well as between vomiting to reach a desired weight and having bulimia. Abnormal eating patterns do not automatically translate into an eating disorder; however, there is a need to pay attention if an athlete shows the following signs or behaviors.

- Commenting repeatedly about being or feeling fat, and asking questions such as "Do you think I'm fat?", when weight is below average
- Reaching a weight that is below the ideal competitive weight set for that athlete and continuing to lose weight even during the off-season
- Eating secretly, which may be noted by finding food wrappers in the room or locker or observing an athlete sneaking food from the training table
- Disappearing repeatedly immediately after eating, espe-



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cially if a large amount of food was eaten

- Appearing nervous or agitated if something prevents the person from being alone shortly after eating
- Losing or gaining extreme amounts of weight
- Complaining frequently of constipation

According to Mallick et al. (21), although a patient may demonstrate abnormal eating patterns and cessation of menstruation, these symptoms alone are not sufficient for diagnosis of an eating disorder. Key clues that a serious problem is present are emotional lability and withdrawal from social relationships. Mallick et al. (21) studied three groups of adolescent females (eating disordered, athletes, and students) to determine their menstrual, dieting, and exercise patterns as well as their self-images. The eating disordered subjects had the poorest self-images and scored extremely low on emotional tone and social relationships compared to the other groups. The most psychologically healthy group was the athletes.

IS ATHLETICS TO BLAME?

Athletics is often identified as a cause of an eating disorder. Fingers are pointed at coaches, weigh-ins, imposed weight restrictions, and activities that are a normal part of athletics. The word "cause" is inappropriate. An eating disorder is a symptom of underlying distress. It is first a coping mechanism and then becomes an additional problem. The athlete who has an eating disorder will also have a history of low self-esteem and difficulty with problem-solving and handling stress.

It is possible, however, for an eating disorder to be "triggered" by a single event or by comments from a person who is very important to the athlete. All members of the sports management team—coaches, athletic trainers, athletic directors, and even teammates—are commonly significant people in athletes' lives and, as such, have the power to be helpful or harmful. An off-handed remark can become deeply imbedded in the mind of a potential anorexic or bulimic. Rosen and Hough (23) reported that 75% of the gymnasts who were told by their coaches that they were too heavy resorted to dangerous weight control measures to lose weight. In another study, Zucker et al. (30) concluded that young athletes may need only one or two suggestions about reducing body fat before they begin maladaptive eating behaviors.

Examples of triggering events or practices that can contribute to the onset of an eating disorder include:

- Telling athletes that they should lose weight without providing them with proper nutritional guidance;
- Telling athletes that they will perform better or get better scores if they are leaner;
- Ridiculing an athlete or making flippant comments about his or her weight or body composition;
- Using labels or names, such as pudgy or thunderthighs
- Assigning unrealistic weight goals; and
- Overemphasizing weight or percentage of body fat.

In an effort to eliminate triggering events, a great deal of attention often is given to the process of weigh-ins. It should be noted that it is not the act of stepping on the scale that triggers an eating disorder. It is not even the numbers that the

scale reveals. It is how the numbers are used that can cause a problem. The risk of triggering an eating disorder is increased when the numbers are used to set unrealistic goals, to browbeat or ridicule an athlete, or to impose excessive pressure on the athlete.

THE ROLE OF THE ATHLETIC TRAINER

Athletic trainers, coaches, and staff members who work closely with athletes should educate themselves about eating disorders—what they are, how to recognize the warning signs, what to do if a problem is suspected, and what treatment options are available. Being prepared to handle the situation when a coach or teammate suggests that an athlete has a problem not only reduces the stress on the staff, but ensures that the athlete will receive the appropriate support and treatment.

The first step in preparing for eating disorder problems is education, with the goal of reaching all members of the athletic department or organization. The type of educational program can range from formal to informal; many local programs as well as national organizations provide educational programs at a minimal cost. There are a number of books, articles, and pamphlets written on eating disorders, and symposiums and workshops are frequently offered on the subject. The National Collegiate Athletic Association (NCAA)* also has developed a three-part video series, *Nutrition and Eating Disorders*. These video programs assist athletic trainers, coaches, and administrators in learning more about the underlying causes of eating disorders, the effects of nutrition and weight on athletic performance, and the steps to take if an athlete shows signs of an eating disorder.

Once the athletic staff is informed about eating disorders, an action plan can be developed. Identifying personnel and resources both within and outside of the athletic department or organization is an important part of this plan. While athletic trainers, coaches, sports nutritionists, and others who work with an athlete can learn to identify symptoms that indicate risk, a diagnosis can only be made by a physician or psychologist trained in eating disorders. Having these key individuals in place will help ensure that the athlete will receive the proper treatment.

Because of frequent interaction, some athletes develop a close relationship with the athletic trainer. As a result of a feeling of trust, the athletic trainer may be perceived as a confidant. It is not uncommon for an athlete to persuade the athletic trainer to work individually with him or her in a subconscious attempt to avoid professional treatment. The trust associated with this plea for help makes it tempting to accommodate. However, it is imperative that the athlete be referred to a professional who specializes in eating disorders.

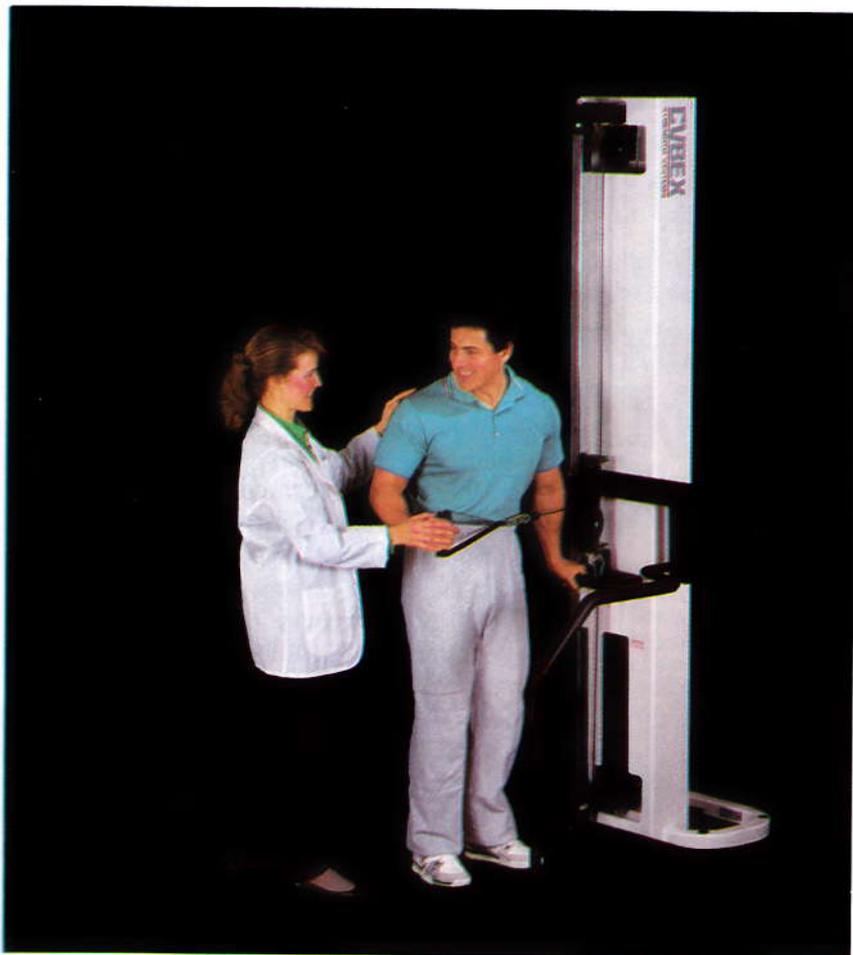
PREVENTION

Athletic trainers can play an important role in helping athletes deal with the emotional and physical distresses of attaining and maintaining weight. Athletic trainers, coaches,

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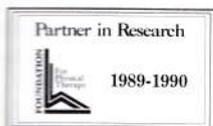
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and teammates can help reduce the risk of triggering eating disorders by being aware of inappropriate behaviors and practices, and by:

- Not overplaying the impact of weight on performance;
- Emphasizing the role of overall, long-term good nutrition practices and weight control in optimizing athletic performance;
- Providing a total nutrition program that includes general nutrition counseling as well as help in appropriate methods of weight loss and weight gain;
- Setting realistic goals that address methods of dieting, rate of weight change, and a reasonable target range of weight or body fat;
- Never suggesting or encouraging purging behaviors;
- Using private weigh-ins to reduce the stress, anxiety, and embarrassment of public weighing;
- Using serial weighings to monitor rapid weight changes and to help detect the use of inappropriate weight loss methods;
- Referring an athlete suspected of having an eating disorder to a specialist, without reprisal or loss of team position; and
- Evaluating policies, procedures, and behaviors of the athletic staff to ensure that they aren't contributing to the development of eating disorders.

Note that the above list did not include eliminating weigh-ins. It is not uncommon for the elimination of weigh-ins to be identified as a primary or sole target for program modification. It is important to keep weigh-ins in perspective. Appropriate use of weighing may in fact be beneficial.

Athletes who have developed eating disorders often refer to traumatic experiences involving weigh-ins because such occurrences are memorable and identifiable. As previously alluded to, however, the problem is how the numbers are used, not the act of weighing. Remarks made on the court or playing field are just as damaging as any remark made during weigh-in.

Efforts should be directed to evaluating the practices of the athletic program and staff and to identifying susceptible athletes. Evaluating how weigh-ins are conducted and how weights are used, and making appropriate alternatives, is definitely indicated. But that is only one part of evaluating the system for practices that damage athletes' self-esteem.

TREATMENT

Eating disorders are now accepted as having psychiatric, physiological, and social components (19). Treatment must therefore address each of these. At present, no single approach may be viewed as the definite treatment of choice. However, the complex, multifactorial nature of anorexia nervosa and bulimia suggests that a disciplinary team approach is the most effective treatment (1). The professionals providing treatment and the athletic staff members need to work closely together so that the messages being provided to the athlete are consistent, and given at the most appropriate times for overall intervention and treatment success.

Most guidelines for the treatment of eating disorders have been developed based on clinical experience with non-athletes. There may be inherent differences in the treatment

of athletes. For example, setting limits on exercise is sometimes used as a part of treatment. It is felt that this eliminates the potential to abuse exercise as a form of purging, helps in weight restoration, and balances caloric intake within healthful energy expenditures. However, such limitations may not be appropriate for athletes.

In summary, to prevent the manifestation of eating disorders and to effectively deal with them if they do occur, athletic departments and sports organizations can:

- Inform and educate staff members regarding eating disorders;
- Develop a system for handling problems should they occur;
- Provide a total nutrition program for athletes that includes general nutrition counseling, as well as assistance in appropriate methods of weight loss and weight gain; and
- Evaluate policies, procedures, and behaviors of the athletic staff to ensure that they aren't contributing to the development of eating disorders.

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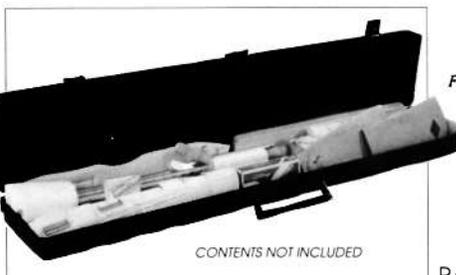
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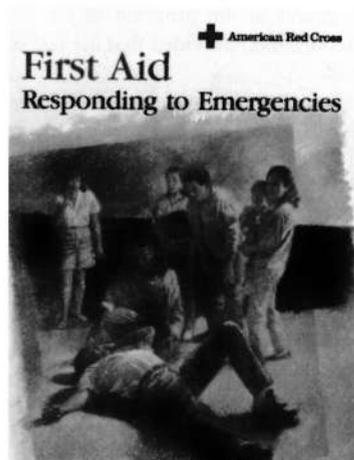
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Questions

Questions	a	b	c	d	e
1. Which of the following athletic populations is most prone to developing eating disorders? a. gymnasts b. figure skaters c. wrestlers d. ballet dancers e. all of the above					
2. Diagnostic criteria for anorexia nervosa include: a. absence of at least three menstrual cycles in a row b. intense fear of becoming obese, even when underweight c. binge-eating d. all of the above e. a & b					
3. Diagnostic criteria for bulimia nervosa include: a. regularly engaging in self-induced vomiting b. regularly engaging in the use of laxatives c. hurried eating of large amounts of food in less than two hours d. all of the above					
4. An abnormal eating pattern is a tell-tale sign of an eating disorder. a. True b. False					
5. Which of the following criteria should be used to determine if an eating disorder exists? a. frequent questioning about being fat b. withdrawal from social relationships c. losing or gaining extreme amounts of weight d. eating secretively e. all of the above					
6. When preparing to handle athletes with eating disorders, the athletic trainer: a. should first educate himself or herself b. should establish a treatment protocol on his/her own c. all of the above d. none of the above					

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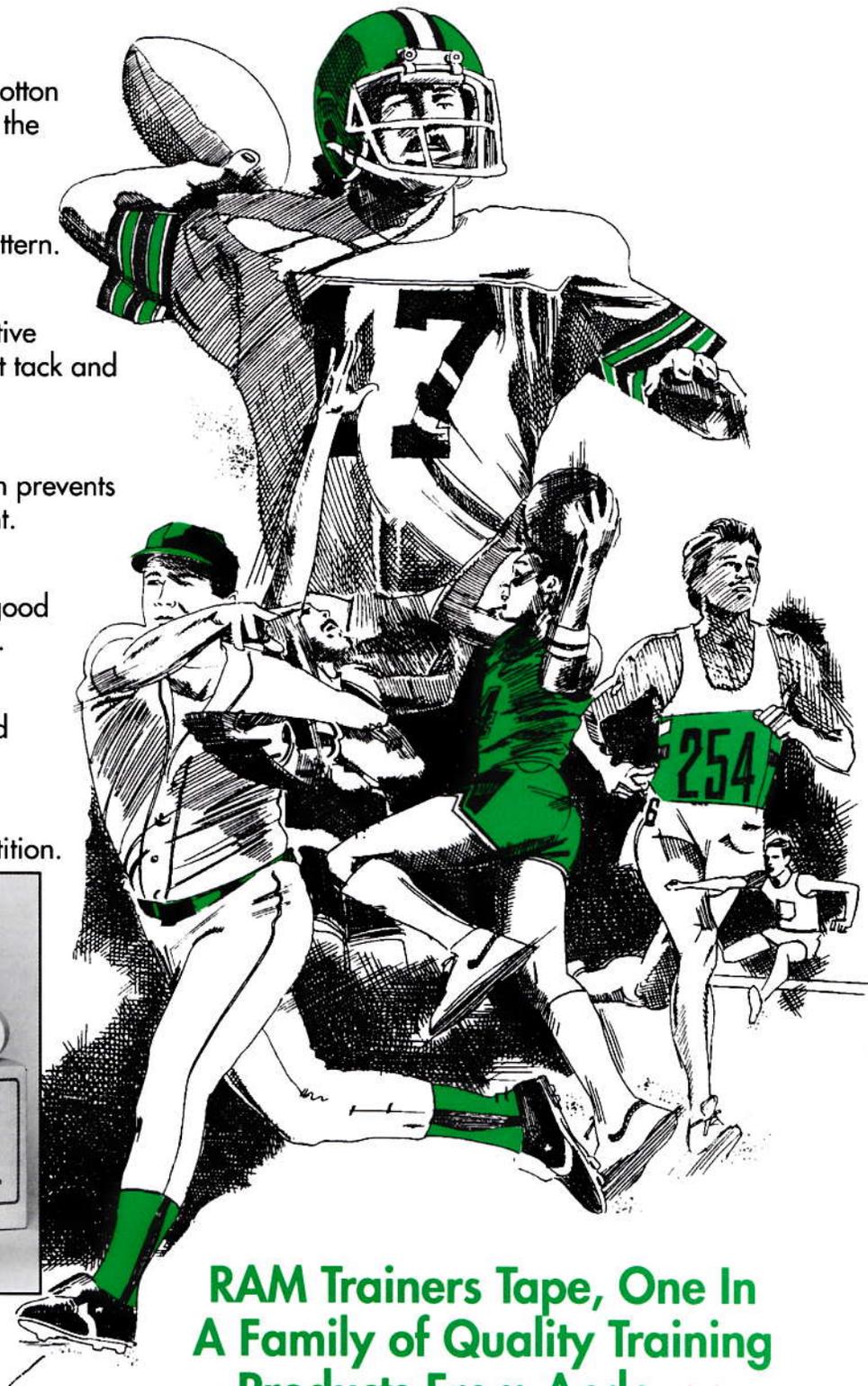
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Questions

a	b	c	d	e

7. In the prevention of eating disorders in athletes, weigh-ins should be eliminated.
- a. True
b. False
-
8. Which of the following criteria should be used to help prevent eating disorders in the athletic population?
- a. emphasizing the impact of weight on performance
b. emphasizing the role of overall, long-term good nutrition
c. periodic and frequent public weigh-ins
d. all of the above
-
9. Treatment of anorexia nervosa and bulimia nervosa should include a team approach.
- a. True
b. False
-
10. Limitation of exercise is an appropriate treatment protocol for the athlete with an eating disorder.
- a. True
b. False

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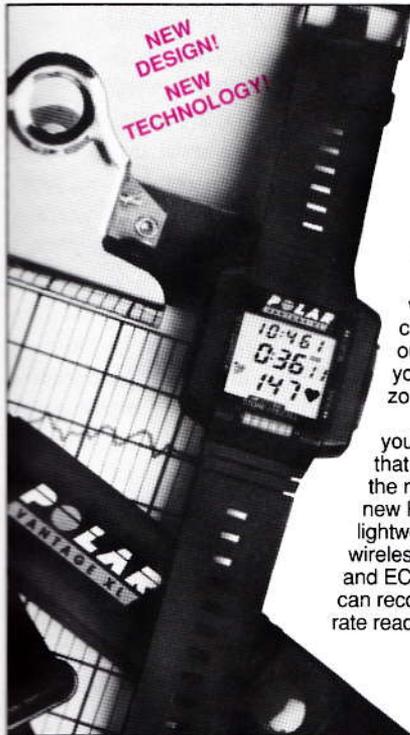
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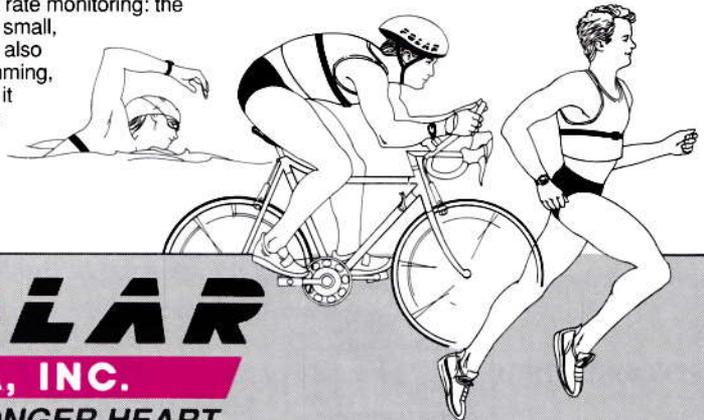
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The Diagnosis and Treatment of Anorexia Nervosa and Bulimia Among Athletes

Craig Johnson, PhD
David L. Tobin, PhD

ABSTRACT: Anorexia nervosa and bulimia are eating disorders that affect predominantly adolescent and young adult women. Anorexia nervosa is characterized by a relentless pursuit of thinness that is achieved through self-starvation. Bulimia involves episodes of binge-eating followed by some form of undoing behavior such as self-induced vomiting, laxative abuse, fasting, or excessive exercise. This manuscript reviews the clinical characteristics, epidemiology, and some of the current theories of etiology of eating disorders. It also presents some of our views concerning effective assessment and treatment. Throughout the review, we highlight some of the special problems associated with athletes who have eating disorders. Overall, the primary task of the authors is to inform various professionals involved with athletes about the presence of these disorders. Our hope is that this effort will heighten awareness regarding eating disorders which will, in turn, facilitate early detection and intervention.

Anorexia nervosa and bulimia are psychiatric syndromes that affect predominantly adolescent and young adult females. We have seen a rapid increase in the incidence of these disorders over the last two decades, which has raised serious questions regarding their etiology and treatment. While debate continues about the causes of anorexia nervosa

and bulimia, experts agree that they are multi-faceted disorders in which biological, familial, and psychosocial factors interact to predispose certain individuals to develop the disorders. Given the multi-determinant nature of the disorders, clinicians (5,10) have found that effective treatment requires a comprehensive initial assessment as well as a range of biopsychosocial treatment interventions.

The purpose of this study is two-fold. The primary purpose is to describe the clinical features of anorexia nervosa and bulimia and some of the current treatments. Since early detection and intervention are so important, athletic trainers, dietitians, coaches, and teachers should be familiar with the signs and symptoms of these disorders.

The second purpose is to briefly speculate about an apparent change in the culture that will probably affect the prevalence of anorexia nervosa and bulimia. More specifically, we believe that Western culture is shifting from an idealized feminine form of anorexic thinness to a form that is characterized by a strong, robust look. In the pursuit of this new look of strength, some of the same individuals who were vulnerable to eating disorders now appear to be struggling with excessive exercise.

Dietitians were often the initial contact for young women who wanted to pursue thinness through dieting during the 70s and 80s. In the 90s, athletic trainers and coaches may be the initial contact for young women who want to pursue a look of strength through rigorous exercise. Consequently, professionals associated with promoting exercise should know some of the variables that identify individuals who may be at risk for exercise overuse.

CLINICAL FEATURES OF ANOREXIA NERVOSA AND BULIMIA

Anorexia nervosa is a syndrome of self-starvation that is

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characterized by a relentless pursuit of thinness fueled by a profound fear of fat (1) (Figure 1). A cardinal feature of the disorder is a body-image distortion of almost delusional proportions. Despite life-threatening emaciation, these patients tenaciously cling to a belief that they are terribly overweight. Usually, they feel safe only if their weight is below their menstrual threshold. Consequently, most have prolonged amenorrhea because they are maintaining their weight 15% to 25% below normal. The prolonged pursuit of semi-starvation also creates a range of highly ritualized behaviors such as obsessive calorie counting, exercising, and weighing. An anorexic's life is so completely organized around avoiding fat and pursuing thinness that social withdrawal and impaired school and work performance are common.

- ✓ Refusal to maintain body weight over a minimal normal weight for age and height, i.e., weight loss leading to maintenance of body weight 15% below that expected or failure to make expected weight gain during period of growth, leading to body weight 15% below that expected
- ✓ Intense fear of gaining weight or becoming fat, even though underweight
- ✓ Disturbance in the way in which one's body weight, size, or shape is experienced, e.g., the person claims to "feel fat" even when emaciated or believes that one area of the body is "too fat," even when obviously underweight
- ✓ In females, absence of at least three consecutive menstrual cycles when otherwise expected to occur (primary or secondary amenorrhea). (A woman is considered to have amenorrhea if her periods occur only following estrogen administration.)

Figure 1. Diagnostic criteria for anorexia nervosa

In contrast, bulimia is characterized by recurrent episodes of binge-eating (at least twice weekly over three months) followed by some form of undoing behavior such as self-induced vomiting, laxatives, fasting, or rigorous exercise (1) (Figure 2). Patients describe the binge-eating as being driven in a way that makes them feel desperately out of control. They often report that it is as if someone else is doing the eating.

The binges usually occur in the evenings when they are alone. The most common moods that precipitate a binge include boredom, loneliness, anger, and anxiety. They typically binge on the high-calorie foods (sweets and carbohydrates) that they normally deprive themselves of. Following a binge episode, the patients usually feel guilty and fat, which provokes some form of undoing behavior. It is important to note that one does not have to be purging, e.g., vomiting or using laxatives, in order to meet the criteria for bulimia. Individuals can be abusing exercise or fasting to relieve their fear of weight gain from binge-eating. Despite recurrent binge-eating, these patients usually maintain their weight within normal limits through purging.

- ✓ Recurrent episodes of binge-eating (rapid consumption of a large amount of food in a discrete period of time)
- ✓ A feeling of lack of control over eating behavior during the eating binges
- ✓ Regularly engaging in self-induced vomiting, the use of laxatives or diuretics, strict dieting or fasting, or vigorous exercise in order to prevent weight gain
- ✓ A minimum of two binge-eating episodes a week for at least three months
- ✓ Persistent overconcern with body shape and weight

Figure 2. Diagnostic criteria for bulimia nervosa

PREVALENCE AND DEMOGRAPHICS OF THE DISORDER

Estimating the prevalence of anorexia nervosa and bulimia has been complicated by problems of definition. Drive for thinness, fear of fat, prolonged dieting, and even binge-eating have been normative for adolescent and young adult women in westernized cultures over the last two decades. As these behaviors have become more common, their prevalence has been frequently overestimated. Early articles reported that 15% to 30% of high school and college women had anorexia nervosa or bulimia.

Since our diagnostic criteria and epidemiological research has improved, it appears that the incidence of anorexia nervosa among high school and college females is less than one percent, and that the incidence of bulimia is one to two percent (2). The incidence among males for both disorders is far less than for females.

In certain high-risk groups, these disorders are much more common. Ballerinas, flight attendants, and fashion models often have an incidence from 15% to 35%. Female collegiate athletes' risk appears to be similar to that of these high-risk groups. Results from three studies of female athletes (3,17,18) indicate that an average of 17% of them had used vomiting for weight control, 20% had used diet pills, and 9% had used laxatives.

The demographic similarities within the group are striking. Nine out of ten are female, and in 90% of all cases, the onset occurs between the ages of 15 and 30 (10). Overall, those affected are single, Caucasian, college-educated females from middle- to upper-class intact families of more than one child. It is important to note that the prevalence of anorexia nervosa and bulimia is directly related to the degree of westernization in different countries. For example, anorexia nervosa and bulimia are as common in Tokyo as in the United States, but they are virtually nonexistent in rural Japan, where there is little westernization. Also, anorexia nervosa and bulimia are virtually nonexistent in lower socioeconomic groups. This suggests that the disorders are highly affected by socio-cultural factors and that they are culture-bound syndromes.

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THE ETIOLOGY OF ANOREXIA AND BULIMIA

As mentioned earlier, although debate continues about the causes of anorexia nervosa and bulimia, the consensus is that both syndromes are disorders with biological, psychological, familial, and sociocultural aspects. It must be emphasized, however, that despite the similarities in demographics and clinical characteristics, the psychological component may differ from patient to patient. Furthermore, it is the search to understand the special meaning of the behavior of each patient that, we feel, defines good treatment.

The at-risk periods for developing anorexia and bulimia are usually adolescence and young adulthood. Two of the central developmental tasks of this time period are separation/individuation from the nuclear family and consolidation of self-esteem or identity. Many of our patients enter this developmental period feeling profoundly undifferentiated and ineffective. Over the last two decades these young women have been living in a culture that has suggested to them that, if they achieve thinness, they will have accomplished self control, discipline, beauty, and success. Consequently, during this time, many young women begin highly restrictive diets in an effort to compensate for self-esteem deficits. For many, achieving thinness is tantamount to "being their own person" and feeling in control of their lives.

We have learned that semi-starvation and weight regulation work against the strategy for achieving self-esteem through thinness. Depriving humans of calories over a prolonged period of time initiates psychological and biological reactions. As people become increasingly preoccupied with food, their moods become very unstable, and they become quite vulnerable to counter-regulatory binge-eating. Biological side effects appear because, as the body drops below a biogenetically mediated level (set point) range of weight, the body compensates by conserving energy and trying to increase body weight to the set point (7). This is particularly true for women, who must maintain approximately 23% adipose tissue in order to menstruate. If body fat drops below this range, a specific biological imperative ensues, which includes a persistent, intense drive toward caloric intake.

Foremost among compensatory behaviors is an increased vulnerability to binge-eating. As patients continue to pursue thinness, they find themselves in a "Catch 22" or what we have termed a "psychobiological impasse" (13). In order to feel in control, they need to diet, lose weight, and pursue thinness. The more they starve, the more their body compensates by increasing their drive to eat. Eventually some stressful event occurs and they begin binge-eating because they are semi-starved. If they begin purging, they learn that they can temporarily quiet the drive to eat by taking in the calories, but then protect themselves from weight gain by purging before they fully digest the food. The purging behavior then becomes an important tool that allows them to pursue thinness and have the experience of eating whatever they want. The binge-purge cycle ultimately becomes a coping strategy to manage a wide range of stressful events and moods.

TREATMENT CONSIDERATIONS

Although we have made significant progress over the last decade with interventions such as individual, family, group, and psychopharmacological treatment, there is still much that we do not know. Given the multi-dimensional nature of the disorder, a sophisticated, comprehensive initial assessment is the most important aspect of the treatment. It is also important that treatment programs have access to a comprehensive range of treatment modalities in order to address the psychological needs served by the behavior. Interventions for these patients include behavioral, psychoeducational, and psychodynamic therapy; group and family therapy; psychopharmacological treatment; and medical and nutritional support.

Initial Evaluation

The following is a brief outline for the intake assessment of eating disorder patients. (See also (10) Johnson and Connors, 1987, Chapter 8, for a more detailed description of this process.) We also have highlighted some special issues we have encountered with athletes who have eating disorders.

Based on the mistaken assumption that eating-disorder patients are homogeneous in their symptoms, some programs offer little more than an administrative screening for entry into standardized treatment. This offers patients a pretense of expertise that may result in treatment failure and the mistaken assumption by patients that they are not treatable. The intake interview is designed to be comprehensive in covering relevant factors that have influenced the course of the disorder and that would affect the course of treatment. For athletes with an eating disorder, it is important to acknowledge that some aspects of their dysregulated eating patterns may be the result of self-discipline and long-term goals. Moreover, it may be necessary for the athletes to continue with a dietary regimen or intensive exercise program that would automatically be targeted for elimination in a nonathlete. For example, most anorexic patients who perform aerobic exercise for an hour or more daily would be asked to stop. For a career athlete, however, aerobic exercise is fundamental to remaining competitive.

Determining what is healthy and what is pathological becomes complex in such cases and will be explored in the following sections. It is important for the evaluator to acknowledge the beneficial behavior of the affected athletes to reassure them that treatment will be in their best interest. The interview is divided into the following subsections:

Weight History. The interview begins with questions about the patient's current, highest, lowest, and desired weight. This often provides a historical record of how weight preoccupations and fluctuations have affected the patient's self-esteem and life adjustment.

Body Image. Body image perception ranges from mild distortions to severe delusions and can reflect the patient's overall adjustment. Though patients have traditionally been preoccupied with being thin as a way of managing intrapersonal and interpersonal difficulties, athletes who train in the

search of other forms of physical perfection (e.g., large pectorals) may be just as pathological. Ideal body shape may vary from individual to individual. Thus, the evaluator must see the dissatisfaction with the body from the patient's viewpoint.

Dieting Behavior. It is important to know at what age a patient began dieting, the frequency of dieting attempts, the degree of restriction, the use of fad diets, and the general pattern of dieting behavior. It is also important to consider training demands of a patient's sport. During wrestling season, athletes may be trying to lose weight, whereas, during football or basketball season, most athletes are trying to increase strength and power (though some overweight athletes might need to diet to lose weight). Evaluators must look at the context in which the patient has tried to lose or gain weight, including the patient's biological set point, the demands of a particular sport, and the feasibility of a particular training goal.

Binge-Eating. The evaluator needs to assess the major life circumstances surrounding the onset of the behavior, the patient's daily routine, and the specific pattern of the episodes. We are interested in knowing the onset, duration, and frequency of binge-eating, as well as the types of foods on which the patient binges. Again, it is important to appreciate training goals when labeling behavior as pathological. For example, high school football players attempting to increase strength and power may eat twice as much as a nonathlete. Such behavior would not be considered binge-eating unless there was a sense of loss of control during the eating episode, or the eating behavior was being used to manage painful emotions.

Purging Behavior. We are also interested in the means a patient employs to purge unwanted calories. Commonly used methods involve vomiting, restrictive dieting, excessive exercise, and the use of laxatives, diuretics, and diet pills. Unfortunately for the diagnostician, these behaviors are virtually normative in some sporting events, particularly wrestling. When trying to assess whether purging is pathological, it is important to consider the context and pattern of the behavior, e.g., the patient may purge only prior to meets in order to make weight. The more circumscribed a particular pattern of purging is, the less likely it is to reflect the presence of an eating disorder or other psychological concern. It is also important to recognize that different purging behaviors can serve somewhat different adaptive functions. For example, restrictive dieting may give a patient a more anorectic appearance, while the use of laxatives frequently adds a self-punitive function to the behavior.

Medical Issues. In addition to assessing the adaptive function of the binge-purge cycle, it is important to evaluate the patient's physical condition for medical complications of bulimia or anorexia. Patients should receive a complete physical examination upon entering treatment. Excessive dieting, binge-eating, and purging can influence endocrine function, disturb blood chemistry, destroy tooth enamel, irritate the esophagus, and disturb the gastrointestinal system. Severe medical complications may make hospitalization the only treatment option.

Personality Disorders. This is, perhaps, the most important aspect of the initial evaluation, as the presence of a personality disorder forecasts a slow, difficult treatment (9). It may even be more crucial for the athlete than for nonathlete patients because eating disorders, binge-eating (e.g., to increase strength and power), dieting (e.g., to increase speed), vomiting or using laxatives (e.g., to make weight), or excessive exercise (e.g., to promote endurance), may be part of a normal training regimen. Thus, to determine whether eating or exercise constitutes excess or abuse, one must consider the extent to which the training regimen is serving a defensive or compensatory function.

Some of this information can be gathered by history. Evidence of stormy, chaotic interpersonal relationships may suggest that training and dysregulated patterns of eating are substitutes for close, interpersonal relationships. The patient's approach to the interview is also an important source of information in assessing personality. For example, the level of mistrust during the interview may suggest the presence of personality disturbances.

Patterns of behavior also indicate personality disturbance. A history of self-injury or other self-destructive behavior is of great concern. For some athletes, this may take the form of avoidable sports injuries. Other patients may have stable relationships, but have difficulty identifying and working toward long-term goals. These patients may look undisturbed, as they can readily adapt to their external environment to meet the needs of others. They have difficulty, however, in meeting their own needs. These patients have been described as having a "false self" or a narcissistic personality disorder (8,10,14). Children or adolescents who are pushed into athletic competition by their family may develop this kind of personality difficulty.

A more formal assessment battery composed of projective testing instruments [e.g., Rorschach Test, Thematic Apperception Test (TAT)] and objective testing instruments [Minnesota Multiphasic Personality Inventory (MMPI)] can be very helpful in specifying the personality profile, but some preliminary decisions about level of personality disturbance must be made on the basis of the interviewer's impressions. The identification of personality disorders and character pathology is crucial to the disposition process (9). In a sample of 55 of our clinic patients with bulimia, 21 were identified as having borderline personality disorders and 19 were diagnosed as being free from personality disorders. While only 21% of the patients without personality disorders remained symptomatic at the end of one year, 62% of the borderline patients continued to meet the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III-R) criteria for bulimia. Eating-disorder patients without personality disorders may benefit from brief therapy. Personality-disorder patients will probably not benefit from brief therapy; both clinic and patient must be prepared to make a long-term commitment to the treatment.

Family Characteristics. Family history, family dynamics, and the patient's current level of family involvement also can play a crucial role in the onset and maintenance of eating-disorder symptoms. It is important to determine the extent to

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which symptomatic behavior is promoted by the family system, as well as to elicit information about communication patterns within the family that may influence individual treatment (15). We try to assess the family's cohesiveness, communication style, method of conflict resolution and behavior control, and the role of the patient's symptoms within the family system. For the athlete with an eating disorder, it is important not only to assess the family's involvement with the eating difficulty, but also to determine the possibility of family over-involvement in the patient's athletic accomplishments.

As in the assessment of personality disturbance, the interview provides two sources of information: family history and the interview process, itself. If the patient is an adolescent or young adult living at home, we insist that the parents come to the evaluation. When family members refuse to attend the evaluation, we can infer limited family support for the patient's attempts to change symptomatic behavior.

General Level of Adaptive Function. In addition to obtaining information that relates to the onset and maintenance of eating disorder symptoms, we are interested in assessing the patient's general level of functioning. Even when there is no sign of personality disturbance, we are interested in the extent to which the patient is able to work, to go school, or to engage in interpersonal relationships. We examine the capacity to be alone and the extent to which time alone is overwhelming and provokes dysregulated eating patterns. We also wish to know if patients are willing and motivated to change, and what intellectual, emotional, and financial resources they can bring to treatment.

DISPOSITION

The above is a description of our standard intake interview. The process takes approximately one and one-half hours. At the end of the interview, the evaluator offers the patient a formulation and a recommendation for treatment. Sometimes the patient needs to gather additional information (e.g., explore family support for treatment), or the evaluator feels the need to seek consultation with clinic staff.

In proposing an initial treatment plan, the evaluator must weigh all of the available information and attempt to match patients with program activities. When the fit between a given patient and our program is not good, we refer the patient to a more suitable program (e.g., a patient with both eating and substance difficulties who might benefit from a twelve-step program). As can be seen in the next section, the treatment interventions that are necessary for the patient population are quite varied.

Clinical Intervention

One of the first issues likely to arise in treating an athlete is the question of how the treatment plan will affect the athlete's training and performance schedule. Our experience is that by the time the eating-disorder athlete gets to our clinic for an evaluation, athletic skills and performance have already been adversely influenced by the gradual progression of symptoms. At this point the athlete is more likely to view the therapy plan as a potential aid in returning to a previously

achieved level of athletic ability. Clinical intervention will be most successful when the athlete feels that the clinician understands the central role of athletic competition in supporting identity and self-esteem.

The therapy plan may call for immediate reduction in or cessation of certain behaviors to which the eating disordered athlete is still strongly committed as part of his or her overall training (i.e., exercising several hours a day, restricting caloric intake). In establishing a treatment contract, the treatment team must help the athlete see clearly that behavior changes that may temporarily limit practice or training will, in the long run, lead to greater overall enjoyment of athletics.

When an athlete has been diagnosed with an eating disorder, it is essential that the treatment team understand how eating-disorder behavior and attitudes are being reinforced by the athlete's performance goals. Restrictive eating or intense, prolonged exercise may be directly related to the athlete's performance expectations. The athlete may then discover that these behaviors can also help him or her cope with certain aspects of everyday living, such as regulating dysphoric affects and resolving intrapsychic and interpersonal conflicts. These behaviors then become more and more entrenched as the athlete sees temporary improvements in performance and relief from the anxiety and depression that is a part of everyday life. The long-term impact of such behavior, however, is quite debilitating and can be fatal.

Active approaches to helping patients manage and eliminate their symptoms include cognitive-behavioral, psychoeducational, self-management, and relapse prevention strategies. Active interventions help patients to break down their eating disorders into discrete behavioral components and then to evaluate the functional value of each component. While many patients can make quick use of active symptom management strategies, others cannot. Some patients require the integration of these symptom-management approaches with psychotherapy. Patients with personality disorders or major depression, may be able to make necessary behavior changes only through an ongoing relationship with a psychotherapist. This allows the patient to understand and resolve the psychological problems that initiate and maintain the development of symptomatic behavior. What follows is a description of the kinds of interventions that have been effective with eating-disorder patients.

Ambulatory Care

Time-limited Psychoeducational Group Therapy.

These groups are most useful for bulimics who are 18 to 30 years old, who have high motivation for change, who are at or near normal weight, and who do not have a personality disorder or other significant problems such as major depression. Psychoeducational groups help patients to understand the cognitive, emotional, and interpersonal triggers of their symptoms. These groups also help members develop normal eating patterns and alternative strategies for coping with negative influences or conflicts. Intervention strategies include self-monitoring, goal-setting, educating about nutrition and the consequences of restrictive dieting, and challenging irrational beliefs about thinness and dieting (7,9). Sharing

their experience with other eating-disorder patients helps individuals overcome the shame that often accompanies an eating disorder. Group members are able to mobilize more quickly when they learn that they are not alone, and that they are not "bad" or "weak" because they have an eating disorder. These groups work best for athletes when there is at least one other athlete in the group.

Individual Psychotherapy. Individual psychotherapy is used to treat both the symptoms of eating disorders (4,6) and the underlying psychological and emotional problems (10). Patients who rapidly form a working alliance with the therapist can make use of educational, behavioral, and cognitive techniques such as those mentioned above to reduce and rather quickly (1 to 4 months) eliminate bingeing and purging. Eliminating restrictive eating in low-weight bulimics and anorexics usually requires a longer, more dynamically oriented course of individual therapy in which maladaptive patterns of self-regulation and attachment/separation are addressed. For the bulimic patient, bingeing and purging may be a way of regulating what is seen as unacceptable impulses or feelings. That is, whenever these impulses or feelings arise, the individual turns to bingeing and purging to generate an experience of tension build-up (bingeing) and tension release (purging). Without dynamic therapy, these issues are likely to remain unresolved.

Nutritional Counseling. Anorexic and bulimic patients have often based their eating and dieting habits on inaccurate information or incorrect assumptions about food, digestion, and weight change. For example, many patients believe that muscle tissue immediately turns into fat in the absence of a vigorous exercise regimen or that any fat that is consumed becomes a permanent part of the body. These false assumptions maintain and strengthen the unhealthy eating patterns.

Counseling by a nutritionist or a well-informed nurse or therapist is an important component in the overall confrontation of the patient's illogical assumptions about food and weight. For example, patients can be given specific meal plans to follow. They can be guided on how often they weigh themselves as a protection against the fear caused by day-to-day fluctuations of body weight.

Medical Monitoring. Any patient who has not had a thorough medical examination within the past year should be advised to do so. Patients with very low weight, obese patients, patients who binge and purge several times a day, patients whose laxative abuse is severe or prolonged, and patients who have an illness, such as diabetes (that may interact with the eating disorder to create potentially life-threatening emergencies), should be seen regularly by an internist familiar with eating disorders. When deciding if a patient needs hospitalization, it is particularly important to assess medical risk.

Psychopharmacological Treatment. Some anorexic and bulimic patients are prone to major depressive episodes or panic attacks and chronic, debilitating anxiety (16). Anti-anxiety or antidepressant medication can be useful in two ways. First, the medication can reduce the subjective intensity of the dysphoric effects and thereby reduce the athlete's need to rely on an eating disorder to manage these painful

feelings. In addition, patients who are not overwhelmed by high levels of depression or anxiety can participate more effectively in the dynamic and cognitive-behavioral components of their treatment plan.

While the link between bulimia and major affective disorder remains unclear, there is some evidence to suggest that a percentage of bulimic patients develop bulimia secondary to the occurrence of an affective disorder (16). Biological symptoms of major depression suggest that pharmacological treatment of the eating disorder may be helpful.

Family and Marital Therapy. Under certain conditions it may be crucial to involve the patient's family in the treatment. The family may unwittingly undermine the patient's progress when the disorder serves an adaptive function for the family as well. Some conditions that suggest the need for ongoing family sessions include: 1) when the patient lives with the family of origin; 2) when the patient demonstrates little evidence of true emotional separation from the family; 3) when there is another serious problem in the family (e.g., alcoholism or physical or sexual abuse); and 4) when the patient requires hospitalization. Treatment interventions help the family to: 1) reorganize dysfunctional relationships and structures; 2) better tolerate stressful emotional events; 3) encourage individualization; and 4) resolve conflicts between members.

Also, a patient's spouse can facilitate both symptom management and emotional healing. Working with the marital couple can help each partner identify the intrapsychic and interpersonal experiences that trigger eating disorders. Once these triggers are identified, alternative coping strategies can be developed by the couple.

Self-Help and Other Support Group Meetings. Support from the patient's therapist, spouse, or family members notwithstanding, ongoing support from others struggling with the same symptoms and underlying emotional issues can often facilitate recovery. Group support helps patients confront day-to-day stresses and increase their understanding of the links between feelings, attitudes, and their food-related behaviors. Not all patients can benefit from these groups, however. Patients with severe ego deficits may not find enough structure in peer-led, self-help groups and can disturb the supportive function of such groups for other patients.

Hospital Care

Under certain conditions, outpatient care may be insufficient to get a patient started on the road to recovery. These conditions may include: 1) additional diagnoses (such as substance abuse) that prevent the patient from using the interventions offered in outpatient treatment; 2) medical complications that endanger the patient's life; or 3) evidence of self-injurious or suicidal behavior. When one or more of these conditions exist, more intensive interventions, such as hospitalization or partial hospitalization (i.e., day or evening treatment programs), can be employed. These interventions must then be followed by one or more of the outpatient treatments mentioned above.

Inpatient Treatment. The primary goals of inpatient treatment are: 1) to normalize the patient's eating habits and

weight and 2) to lay the groundwork for ongoing recovery following discharge to outpatient treatment. The first goal is accomplished by having each patient move through a structured, well-monitored eating protocol where patients assume increasing responsibility for their nutritional needs. The second goal is accomplished by reinforcing self-care, and by helping patients identify self-destructive behaviors and work through intensely negative transference. The inpatient milieu is the environment that patients need to learn the difference between acting out and working through their feelings. It disrupts the self-defeating cycle of acting out, followed by negative feedback (i.e., you are "bad" or "sick"), followed by more shame and self-hate, followed by more acting out.

Partial Hospitalization. There is a subgroup of patients for whom weekly or semiweekly psychotherapy is insufficient and for whom inpatient hospitalization is too restrictive, because it may interfere with the maintenance or development of ego strengths and coping behavior. Placement in a day or evening hospital program can be an alternative to inpatient hospitalization, when the patient needs or wishes to continue working, going to school, or living at home during treatment. Placement in a partial hospital program can also be used as part of a discharge plan for hospitalized patients, as they can be most vulnerable to symptom relapse when they leave the structure of the inpatient milieu.

TREATMENT OUTCOME

The literature indicates that at one- to two-year follow-up, approximately one third of our patients will be completely recovered, one third will be significantly improved, and one third will be unchanged. What predicts favorable outcome and who responds best to what types of interventions remains unclear. Although the database has not been refined to prove it, we believe that early detection and intervention will emerge as two of the best prognostic indicators of favorable outcome. Likewise, we feel that significant co-morbidity (depression, personality disorder, chemical dependency) suggests less favorable outcome.

Athletic trainers who suspect that an individual might have an eating disorder should encourage the patient to speak with a counselor at an established and comprehensive eating-disorder program. If such a program is unavailable, the individual should contact a comprehensive mental health facility.

CASE EXAMPLE

The following case describes a college athlete with bulimia nervosa and major depression. "Carey" was a 20-year-old junior who became very depressed toward the end of the fall quarter. She had a scholarship for volleyball and had been on the varsity team for the last two years. The patient was 5'10" and ranged in weight from 150 to 165 lbs. During the beginning of the winter quarter, the patient became so depressed that she attempted suicide by taking a large dose of aspirin. She had significant sleeping difficulties and could not concentrate on her schoolwork. The patient began isolating herself in her room, until she decided to come home for the winter.

The patient was evaluated for her depression and eating difficulties. She weighed 165 pounds at the time and wanted to lose 10 lbs. She felt very unattractive, especially when compared to her mother, who was thin and glamorous. The patient identified with her father, who also was depressed. Both father and daughter were passive, dysphoric, and introverted, while the mother was extremely extroverted.

There were four components to the treatment of this patient. She was first seen in individual psychotherapy twice weekly. She also began a trial of antidepressants. Individual therapy helped the patient examine core issues related to self-esteem and to the difficulties she had in competing and identifying with her mother. Family therapy also was started to begin dialogue between mother and daughter, and to identify family issues that might be impeding the patient's ability to separate from the family. It was particularly empowering for the patient to realize that she appreciated her mother more than she had previously imagined. The patient's bulimia was not severe and was largely driven by a desire to lose weight. The patient would diet for several days but then become frustrated and bored and end the diet. This led to self-criticism and a decrease in self-esteem. When she recognized that her self-deprecation was partly the result of competition with her mother, she was able to reduce the pressure she put on herself to lose weight. Also, Carey read several articles about the sociocultural pressure to be thin and decided to stop dieting. She resumed regular eating (i.e., three meals a day) and began a reasonable aerobics regimen. These activities helped her to lose the weight she wanted without having to diet. The patient returned to school in the fall, where she continued psychotherapy. She also resumed her participation in varsity volleyball.

Although her eating disorder was not severe, she is a good example of how complicated a case can be and of the number of treatment modalities that are sometimes necessary. To the extent that her weight reduction was critically important to her participation in volleyball, the eating symptoms could have been much more entrenched. Also, the family's participation allowed the identification and resolution of competitive issues.

In summary, it is very important to be able to discuss with patients the sociocultural, biological, and psychological components of their eating difficulties, and to be able to offer information and skills training that can help. It is also important to examine the broader context in which the eating difficulties may serve a compensatory function. We have tried to show how this could result in a straightforward treatment. Alternatively, as in the case above, the reasons for the patient's eating difficulties can be very complicated and treatment will have multiple dimensions. It is important that such complicated patients have a thorough initial evaluation and access to a broad range of clinical services.

EATING DISORDERS AND EXERCISE ABUSE: OLD WINE IN A NEW BOTTLE

As mentioned earlier, it is our opinion that we are on the cusp of a transition in this culture about what is idealized as attractive among women. Since the mid 60s, an appearance

of extreme thinness has been highly valued. Furthermore, we believe that the increased incidence of anorexia nervosa and bulimia is the result of the attempt to achieve this idealized thinness. We recently published some preliminary data, suggesting a shift away from the pursuit of thinness to the pursuit of a look of strength.

In 1981 we surveyed a socioeconomically and ethnically diverse suburban high school to investigate the prevalence of eating-disorder behavior and attitudes (11). We sampled 1200 girls, who were thirteen to eighteen years old. In 1986 we repeated the study (12). This allowed us to investigate the change in the incidence of eating disorders among a new group of students. Our findings surprised us. In 1981, four percent of the female students met the criteria for clinical bulimia. The incidence had dropped to two percent in 1986. Among the young women, there was a consistent and significant shift away from dieting behavior and the drive for thinness.

The one variable that did not change was body dissatisfaction. The young women in 1981 and 1986 were equally dissatisfied with their bodies. In 1986, however, they appeared less inclined to remedy this dissatisfaction by pursuing thinness through excessive dieting. In talking with the young women, we learned that they were much more interested in achieving an appearance of robustness, rather than the gaunt, emaciated look of the previous years. "Firm" had replaced "skinny" as the word used most frequently to describe the look that they wanted.

The results of the study matched our clinical experience that many young women were shifting their focus from excessive dieting to excessive exercise. Those who appeared to be at risk for attempting to solve self-esteem and self-regulatory problems by manipulating their bodies through excessive dieting, may now be replaced by a group attempting to compensate by overexercising. We also are beginning to see an increase among women in the side effects of pursuing a look of strength through excessive exercising, such as increased orthopedic injuries, abuse of steroids, etc. From our perspective, the shift from bulimia to excessive exercise is essentially old wine in new bottles.

One important implication of this shift is that athletic trainers, rather than dietitians, may be the initial contact for young women who are struggling with psychological problems. Consequently, it is particularly important that professionals involved in athletics be informed about some of the maladaptive behaviors so that young women may approach them for safe exercise programs.

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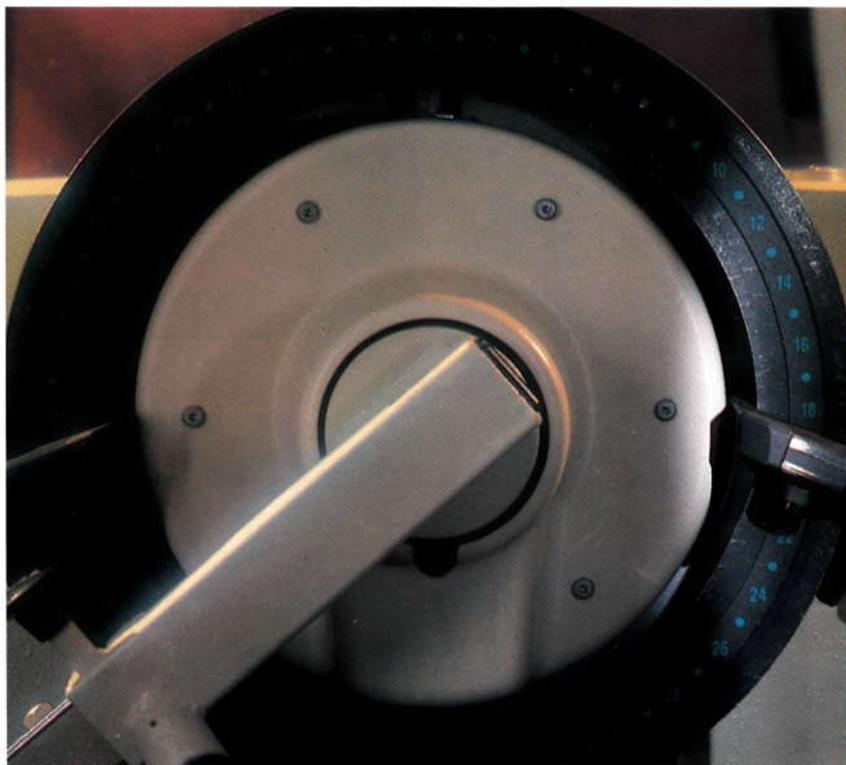
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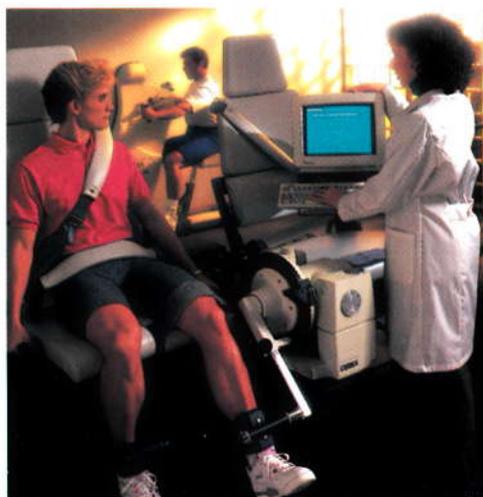
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Medical Consequences and Complications of Anorexia Nervosa and Bulimia Nervosa in Female Athletes

John N. Stephenson, MD

ABSTRACT: Athletes with anorexia nervosa, bulimia nervosa, or a combination of these two eating disorders are prone to significant medical complications as a result of their intense training programs and their will to win. Often these eating disorders are well-concealed and may present as vague medical complaints, muscle fatigue, dehydration, and the more obvious excessive weight loss. An athlete with anorexia or bulimia nervosa suffers double jeopardy when complications such as reduction of bone density, cardiac damage, and electrolyte disturbances occur. Such athletes, most of whom are female, may be resistant to reasonable therapeutic guidelines from the athletic trainer and team physician. When this occurs, more intensified medical management and referral to an eating-disorders program may become necessary. These forms of intervention should ideally be undertaken with the full knowledge and support of the athletic trainer, coach, and team physician.

Medical complications associated with anorexia nervosa, bulimia nervosa, or a combination of these two disorders are a result of the following: the starvation process itself; bingeing behavior; and attempts to control weight artificially by rigorously exercising and vomiting, and by abusing laxatives, diuretics, and diet pills (pathogenic behaviors). Rosen, et al.(24) found that 32% of 182 female collegiate athletes answering a confidential questionnaire practiced at least one of the weight-control behaviors defined as pathogenic. Although such behavior may not be indicative of a

clinical eating disorder per se, it may adversely affect an athlete's performance and health. The rapidity of onset of complications is related to the athlete's general health; the type of sport; the intensity of training; the frequency, intensity, and duration of the eating disorder; and the timing and quality of medical and psychological intervention (Table 1).

Anorexia nervosa is customarily considered a disorder of early adolescent females, although from 5% to 10% of cases occur in males (6). Bulimia nervosa is also predominantly a disorder of females and ordinarily begins during later adolescence. Yates, et al. (30) have described a subgroup of male athletes designated as "obligatory runners." These individuals have an unequivocal commitment to running, a bizarre preoccupation with food, and an unusual emphasis on lean body mass in the third to fifth decade of their lives.

Athletes have gone to extraordinary lengths to reduce their body fat stores (5). Initially, such weight loss may be interpreted by the coach, athletic trainer, and physician as an acceptable way of enhancing function. Other investigators suggest that some female athletes lose weight to enhance appearance, not performance. In sports such as gymnastics, diving, and figure skating, performance and appearance are often linked in the minds of judges, adding further pressure to achieve the hyper-lean look idealized in the media (28).

Female athletes who have lost weight as a result of insufficient calorie intake, but who are not more than 20% below ideal body weight, have no clinical or laboratory abnormalities except for irregular or absent menstrual periods (4). Individuals who are between 20% and 35% below ideal body weight gradually begin to have noticeable abnormalities, which, although seldom life-threatening, ultimately interfere with athletic performance and alter lifestyle. This sub-group of female athletes presents a significant challenge to members

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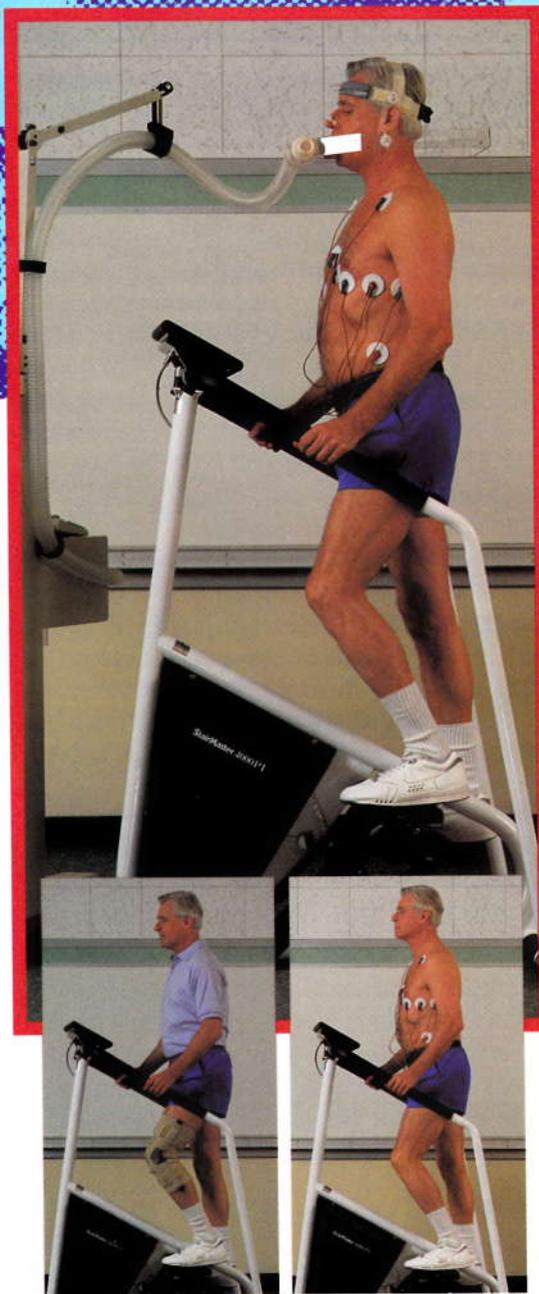
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of the sport management team. To label such an athlete as anorexic, on the basis of weight loss alone, is as inappropriate as denying her nutritional education, supportive counseling, and evaluation for a possible eating disorder.

Table 1. Medical complications of anorexia and bulimia nervosa

In addition to restrictive eating, vomiting, binge-eating, laxative use, and diuretic use, complicating factors include: excessive use of caffeine, ipecac, sorbitol, alcohol and other drugs, and excessive exercise.

Restrictive Eating - Low Weight	Dehydrated
Loss of menstrual periods	Irregular heart beat rhythm (arrhythmia)
Lanugo (fine body hair)	Muscle weakness
Slow heart rate	
Cold, bluish hands and feet	Vomiting
Dehydrated, dizzy, faint	Electrolyte problems
"Low thyroid"-cold, constipated, dry skin, coarse hair	Dehydrated, dizzy, faint
Osteoporosis	Muscle weakness
Retardation in growth in height	Dental - enamel erosions, caries
Swelling of feet, legs, hands	Irregular heart rhythms (arrhythmias)
Congestive heart failure	Sore throat; sores in mouth and on gums
Depression, suicide	Nose congested
Kidney stones	Increased size of salivary glands
Decreased kidney function	Blood in emesis
	Calluses
Binge-Eating	Esophageal rupture
Obesity	
Swelling of feet, legs, hands	Laxatives (do not significantly reduce calories)
Acute stomach dilation; rupture possible	Dehydrated, dizzy, faint
Depression, suicide	Electrolyte problems
	Irregular heart beat rhythms (arrhythmias)
Diet Pills	Muscle weakness
Elevation in blood pressure	Rectal bleeding
Stroke	Feeling constipated when laxatives are stopped
Heart attack	Swelling of feet, legs, and hands when discontinued
Seizures	
Restlessness, anxiety	
Diuretics	
Electrolyte problems	

Significant and sometimes life-threatening physiological changes may occur in normal or overweight athletes with bulimia nervosa. Vomiting, or abuse of laxatives, diuretics, or diet pills may develop in these female athletes as they attempt to counteract bingeing behavior and weight gain. When athletes combine exercise and caloric restriction with pathogenic weight control behaviors, the potential for lethal consequences increases considerably.

Often the eating disorder is well concealed by an athlete who is reluctant to give up her symptomatology. Complaints of fatigue, muscle weakness, restlessness, anxiety, and mild depression may easily be misinterpreted as "burn out." An overuse syndrome may become chronic before it is appreciated that the athlete is running in pursuit of thinness, rather than for competitive excellence.

ANOREXIA NERVOSA (STARVATION)

Anorexia nervosa is a syndrome of starvation which includes: 1) a marked fear of fatness, a disturbed perception of body image, and an obsessional desire to lose increasing

amounts of weight; 2) self-starvation with significant weight loss, usually reaching more than 15% below minimal normal weight for height and age; 3) amenorrhea and other physical signs of starvation; 4) physical hyperactivity and sleep disturbances; 5) other mental changes, including bizarre behaviors and attitudes about food, sometimes accompanied by self-induced vomiting and binge eating and a stubborn denial of illness; and 6) no known physical or other psychiatric illness that can account for the weight loss and other symptoms and signs (7,3). Psychological changes include an increasing preoccupation with food, but a refusal to eat sufficiently. Physiologically, the anorexic experiences significant hunger. If calorie deprivation persists, various adaptive mechanisms are called into play.

Anorexics characteristically restrict not only caloric intake, but also carbohydrate and fat intake. Their total daily caloric intake may not exceed 500 calories, but is relatively high in protein, which helps to conserve the anorexic's lean body mass. Initially, a breakdown of stored body fat by lipolysis and ketogenesis provides ketones at levels high enough to be used by the central nervous system as an alternative fuel to glucose. If significant caloric restriction persists, and body fat stores fall below 7% of body weight, the process of gluconeogenesis increases dramatically. Under these conditions, protein (lean body mass) is converted to glycogen as an energy source with the subsequent loss of muscle mass, strength, and endurance.

In starvation states, the active form of thyroid hormone, triiodothyronine (T3), is diminished as a physiologic adaptation to conserve caloric stores by diminishing metabolic rate (27). Low thyroid status is suggested by the following: cold intolerance, constipation, dry skin, coarse hair, carotenemia (yellowing of the skin secondary to increased deposition of carotene), cold bluish hands and feet, and bradycardia (pulse rate under 60 beats per minute). The bradycardia noted in this hypometabolic state is not indicative of fitness or of a high level of performance capability.

When death occurs in association with anorexia, it is often a result of cardiac complications. The direct effect of starvation on the heart is the reduction of cardiac chamber dimensions and left ventricular mass. Reduced maximum working capacity during exercise occurs, probably as a result of marked loss of general muscle mass (12). This degree of cardiac pathology is rarely seen in adolescent and young adult anorexics, although it would seriously jeopardize athletic performance should it occur. An anorexic athlete recovering from significant weight loss may be vulnerable to cardiac overload. The presence of a co-existing disorder such as diabetes mellitus, or a rapid increase in the athlete's solute load secondary to significant salt consumption, could lead to rapid heart failure. This may be the result of an attempt to gain weight for a brief time in order to meet the expectations of a treatment program or other authority.

Abnormal electrocardiographic (ECG) patterns are present in a majority of anorexic patients (13). Of greater significance for the athlete is the occurrence of arrhythmias during exercise. Gottdiener, et al. (12) described a patient who displayed a short-run of ventricular tachycardia, and three

other patients with occasional ventricular premature beats during exercise. Thurston and Markes(29) found several of their patients to have prolonged QT intervals. This condition is associated with sudden death.

Menstrual irregularities may occur in individuals with anorexia nervosa, and to a lesser degree, in bulimics. Stress or rigorous athletics also may be associated with an increased prevalence of menstrual dysfunction. This is especially the case in sports such as running, ballet, and gymnastics, which require intense daily training combined with lean body build. The pathophysiology of menstrual dysfunction in these individuals is hypothalamic in origin (16). The mechanism by which this occurs remains unknown, although it reflects an impairment in the pulsatile release of gonadotropin releasing hormone from the hypothalamus, which leads to secondary deficiencies of gonadotropins, estrogen, and progesterone, and to a loss of ovulation (18).

Severe disturbances of menstrual function in patients with anorexia nervosa are associated with low bone mass and an increased risk of fracture (23). The same is true in elite athletes who have amenorrhea (10). Marcus, et al. (17) found that women marathon runners with regular menstrual cycles had increased vertebral bone density by CT scan as compared to age-matched nonathletic controls; whereas amenorrheic long distance runners had decreased vertebral density. Six of the eleven amenorrheic runners in this study had experienced stress fractures, versus only one of the six runners with regular menstrual cycles. Among athletic women, there is a correlation between the extent of menstrual cycle disturbances and the amount of the decrease in spinal bone mass (9). The prognosis for today's elite female athletes is unknown. Their prolonged and intense training programs may put them at special risk for amenorrhea and decreased bone density (osteopenia), especially of spinal trabecular bone. Prior, et al.(22) have recently shown that this loss of spinal bone density may occur at a rate of 3 to 4% per year. This has serious long term implications as it would result in a far lower spinal bone density at menopause than has generally been reported by other investigators.

Marcus, et al.(17) showed that amenorrheic marathon runners not only had an increased rate of stress fractures, but also had low calcium and caloric intakes. Mansfield and Emans (16) recommend that athletes with amenorrhea should try to increase their caloric intake, as well as increasing their daily calcium intake to 1500 mg per day. The intensity of athletic training also should be reviewed. Presumably the cause of bone loss among amenorrheic women is estrogen deficiency. If the athlete remains amenorrheic during the next three months, a hormonal regimen should be considered, especially if the patient's serum estrogen is low or if she fails to have withdrawal bleeding after receiving a five day course of Provera. Long-lasting results in terms of prevention of osteoporosis by this approach are unknown, but are under study. The goal of treatment is to maximize bone mass in order to potentially reduce the risk of osteoporosis in later years.

BULIMIA NERVOSA

Bulimia nervosa is an eating disorder characterized by

binge eating coupled with pathogenic weight control behaviors as noted previously. Although several features of this disorder are also seen in anorexia nervosa, the profound emaciation of anorexia nervosa is not present; most persons with bulimia are of normal weight or slightly overweight.

Abraham and Beumont (1) studied 32 bulimic subjects and found the most common physical symptoms to be swelling of hands and feet (69%), abdominal fullness (66%), fatigue (47%), headache (38%), and nausea (34%). In a report of 275 women with bulimia, patients reported weakness (83.6%); bloating (75.2%); "puffy cheeks" (50.1%), presumably related to parotid gland swelling; dental problems (36.5%); and finger calluses (27.4%), presumably related to trauma and subsequent callus formation on the back of the hand caused by using the hand to stimulate the gag reflex mechanically (19).

Binge eating as an isolated behavior may lead to obesity, and in fact, many bulimics are overweight if not obese. Often binge eating is practiced by young adult men, especially athletes trying to "make weight", and usually is benign (25). However individuals also may suffer from acute dilation of the stomach and pain in the abdomen.

Diet pills are taken as appetite suppressants. They frequently contain phenylpropanolamine, a sympathomimetic amine. Even a single 85 mg capsule has been reported to cause significant hypertension (11). In addition, recommended doses in combination with caffeine have been associated with cerebral hemorrhage, cardiac arrhythmias, seizures, myocardial injury, and death (21).

Abuse of diuretics may lead to dehydration and loss of potassium and magnesium. As a result, orthostatic hypotension, cardiac arrhythmias, and muscle weakness may occur (27).

Repeated vomiting as a method of gaining control after or during significant bingeing is commonly reported in bulimia. Complications include: dental enamel erosion with resulting dental caries, especially of the inner central incisors; sore throat, mouth, and gums; nasal congestion; increased size of salivary glands; and the presence of blood in the emesis (27). The most serious medical consequences of vomiting are the resulting fluid and electrolyte imbalances. Repeated vomiting is associated with a loss of significant hydrochloric acid and fluid volume from the stomach. Compensation by the body involves kidney mechanisms that result in the retention of sodium ions, but in a loss of potassium ions. These electrolyte losses, plus the loss of hydrogen ions from vomiting, result in metabolic alkalosis. The effect of potassium depletion contributes to the kidneys' inability to concentrate urine, muscle weakness, and cardiac arrhythmias, and in some cases, to death (27). The chronic dehydration associated with vomiting occasionally results in kidney stone formation (26).

The repeated or high dose use of the emetic ipecac may cause such cardiac disturbances as conduction defects, dysrhythmias, and a fatal form of cardiomyopathy. Adler, et al. (2) have described a patient who died of ventricular tachycardia under such conditions.

Abuse of laxatives may result in the loss of potassium,

sodium, and magnesium from the colon (27). Chronic abuse leads to dehydration and excessive sodium losses in the stool, as well as to a state of metabolic acidosis resulting from bicarbonate loss. The lowered serum sodium triggers the loss of potassium through the kidneys in their compensatory attempt to conserve sodium. In addition to the already noted effects of a lowered body potassium on muscle function and nerve conduction, individuals may develop abdominal pain secondary to an adynamic paralytic ileus (27).

When the athletic trainer identifies an athlete with a possible eating disorder, the athlete should immediately be referred to a physician knowledgeable in eating disorders. Further history, physical examination, and laboratory tests will determine the extent of the problem. Unfortunately, a simple directive from the athletic trainer or the physician to improve eating behavior and avoid vomiting and other methods of pathogenic weight control is rarely successful with athletes who have developed a well-established pattern of bulimia or anorexia. Specialized treatment programs are usually indicated. Treatment may require a year or more of symptom management and psychotherapy. Appropriate psychosocial support from the athletic trainer, team physician, and coach is very important to the athlete during his or her treatment and after recovery.

SUMMARY

In sports in which low body fat is perceived as a competitive advantage, many athletes limit their nutritional intake or use vomiting, purging, diuretics, or diet pills as an aid in weight loss or weight control. Excessive weight loss and/or wide fluctuations in an athlete's weight may not be the result of simply food aversion or social factors. This is particularly the case when the following are present: distortion of body image, depression, and a general sense of inadequacy. Although pathogenic weight control behavior is usually well concealed by the athlete, it is imperative that an early diagnosis be made. The more established the behavior becomes, the more resistant the individual athlete ultimately will be to change.

Athletic trainers should be alert to the early signs of eating disordered female athletes, which include:

- Dieting without regard for health;
- Disorganized eating patterns, such as meal skipping on various pretenses, highly rigid dieting, unusual or extreme food preferences—especially carbohydrate avoidance;
- Withdrawal from teammates, other friends, athletic trainers, and coaches;
- Hyperactivity, i.e., relentless involvement in activity in a manner that may appear frantic and often not goal-oriented;
- Changes in mood, increased irritability, and/or increased anxiety or depression;
- Changes in athletic performance, especially regarding simultaneous striving for perfection and verbalization of a sense of ineffectiveness;
- Excessive exercise including exercising outside of the previously routine training periods;

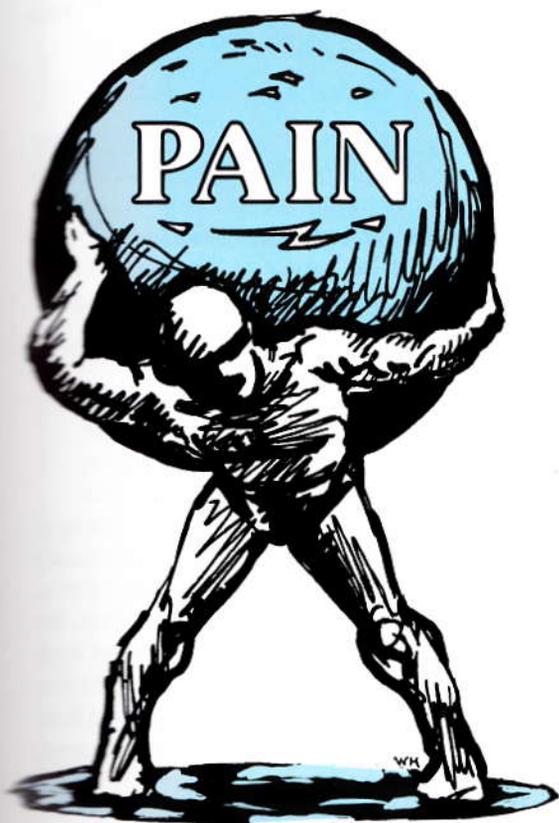
- Irrational interpretation of appearance;
- Changes in menstrual cycle or amenorrhea;
- Excessive weight loss;
- Abuse of laxatives, emetics, diuretics, or diet pills; and
- Binge-eating—especially of sweets, breads, ice cream, and salty snack food.

In the early stages of an eating disorder, competitive performance may be unaffected. Ultimately the athlete's performance and health will suffer if pathogenic weight control behavior persists. Successful early intervention will often require a high level of cooperation, determination, and commitment from the coach, athletic trainer, and physician. Affected athletes will need to be referred to a clinic specializing in the treatment of eating disorders.

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Eating Disorders in NCAA Athletic Programs

Randall W. Dick, MS, MS

ABSTRACT: A survey was distributed to athletic administrators of 801 NCAA institutions in an effort to determine the prevalence of eating disorders in students involved in collegiate athletic programs. Results indicated that at least 40 percent of NCAA athletic programs have had an athlete with an eating disorder in the last two years, primarily in women's sports. While athletes in certain sports appear to be at greater risk, the wide variety of programs reporting eating disorders indicated that no sport should be considered exempt from this problem. Further education about this topic for administrators, athletic trainers, medical personnel, coaches, and athletes is encouraged.

Many of today's athletes face a difficult paradox in their training regimens. They are encouraged to eat to win, to fuel their bodies for health and performance. Yet, they often face self- or team-imposed weight restrictions.

Emphasis on low weight or on body composition may benefit performance only if the guidelines are realistic, the caloric intake is reasonable, and the diet is balanced. The use of extreme weight control measures can jeopardize the health of the athlete and possibly trigger behaviors associated with defined eating disorders.

Two of the major disorders of concern to today's student-athletes are anorexia nervosa and bulimia. Anorexia nervosa is self-imposed starvation in an obsessive effort to lose weight and become thin. Intense fear of becoming obese causes the anorexic to think almost constantly about food, dieting, and excessive exercise. Bulimia, on the other hand, is characterized by secretive binge-eating episodes usually followed by purging in the form of self-induced vomiting, or using laxatives or diuretics. Both of these disorders can result in severe physical and psychological problems for the athlete (5,7).

In an effort to better inform coaches, athletes, and admin-

istrators about eating disorders, the National Collegiate Athletic Association (NCAA) has developed a project entitled "Nutrition and Eating Disorders in College Athletics." Project materials consisting of informational videotapes, written materials, and posters have been distributed to athletic administrators at each NCAA member institution (13).

Information concerning the prevalence of eating disorders in the general population is limited, and even less is known about this problem in the collegiate athletic population. Therefore, this project also called for the development of a short survey, distributed to the entire population of member NCAA institutions, to establish the prevalence of eating disorders in intercollegiate athletic programs. This paper reports the results of that survey.

METHODS

In March 1990, a one-page survey was sent to senior women administrators (SWAs) of athletics programs at each of the 803 NCAA member institutions as a follow-up to the distribution of eating disorders educational materials. Directors of athletics received the survey at those schools not having a defined SWA. Schools were asked to respond anonymously to the following:

Have any student athletes in your athletics program (excluding intramurals) experienced an eating disorder (anorexia nervosa or bulimia) in the last two years (1988-90)? If so, please indicate the sport(s) in which the eating disorder(s) was/were reported.

While some researchers have categorized over-eating or obesity as an eating disorder (5), this study specifically examined the prevalence of anorexia nervosa and bulimia. Because of the difficulty in diagnosing these problems, the survey did not ask how many cases of eating disorders were present in athletes within a given sport; rather, a sport was checked (a report) if the administrator was aware of at least one person with an eating disorder participating in that sport.

RESULTS

Sixty-one percent (491) of the 803 member institutions responded to the survey. Of the responding institutions, 313

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(64%) indicated that at least one eating disorder of a student athlete had occurred. The remaining 178 respondents reported having no persons with eating disorders in their athletics programs.

The 313 institutions that responded positively to the presence of eating disorders submitted 872 reports or 2.8 sports per responding institution. Because every NCAA member institution sponsors multiple sports, it is entirely possible to have more than one report from an individual institution. For example, a school reporting eating disorders in men's gymnastics, women's swimming, and women's tennis would contribute three reports.

It should be re-emphasized that reports do not indicate the number of individuals with a problem; rather, a report is any sport in which at least one person with an eating disorder was noted. Survey results indicated that 810, or 93 percent of the reports, were in women's sports. The remaining 62 reports were in men's sports (Figure 1).

PREVALENCE BY SEX

(313 schools - 872 reports)



Figure 1. Prevalence of eating disorders in college athletic programs by gender (Ninety-three percent of the reports occurred in women's programs.)

Results by sport are shown in Tables 1 and 2. The first column indicates the sport category. Swimming, diving, field events, and track have been listed as separate categories. The second column "Sponsoring Schools," indicates the number of NCAA institutions sponsoring a given sport during the 1988-90 seasons. The survey was distributed to 803 member institutions; however, every institution did not sponsor every sport. The third column, "Schools Reporting ED," indicates the number of institutions reporting at least one eating disorder in a particular sport. The fourth column indicates the percentage of schools sponsoring a given sport that reported an eating disorder.

The data reported in these tables are most likely minimal values. For example, 108 NCAA institutions sponsored women's gymnastics programs. Fifty-two institutions reported at least one case of an eating disorder in their women's gymnastics program, which was 48 percent of all schools sponsoring the sport. If each of the other 56 schools were among the 178 responding institutions reporting no eating disorders, then this percentage is an accurate reflection of the problem in the NCAA women's gymnastics programs. How-

Table 1. Eating disorders (ED) in NCAA intercollegiate men's sports (62 reports)

Sport	Sponsoring Schools	Schools Reporting ED	% Sponsoring Schools Reporting ED
Wrestling	278	20	7%
Cross Country	664	17	3%
Gymnastics	45	1	2%
Track (running events only)	554	9	2%
Football	530	6	1%
Swimming (only)	360	2	1%
Baseball	672	6	<1%
Basketball	767	3	<1%
Diving (only)	360	1	<1%
Soccer	544	1	<1%
Tennis	675	1	<1%
Fencing	48	0	0
Golf	579	0	0
Ice Hockey	123	0	0
Lacrosse	153	0	0
Rifle	54	0	0
Skiing	39	0	0
Track (field events only)	554	0	0
Volleyball	54	0	0
Water Polo	54	0	0

ever, it is probable that some of the 56 schools failed to respond to the survey at all and that some of these schools actually did have an athlete with an eating disorder. Therefore, in most cases the percentage of sponsoring schools reporting an eating disorder reflects a conservative estimate.

DISCUSSION

At first glance, there appears to be no reason to associate eating disorders with the active competitive athlete who needs a proper diet to fuel daily workouts. Yet, research is beginning to show that this problem is a growing concern of the athletic population. Previous studies have reported pathogenic weight control behaviors, preoccupation with weight, tendencies toward eating disorders, and actual eating disorders in athletes at a limited number of institutions (2,3,8,10,11). The present study takes a broader view by evaluating the prevalence of eating disorders across a large range of sports in a national population of collegiate athletic programs, specifically the 803 NCAA member institutions.

Eating disorders, as defined by the *DSM-III* diagnostic criteria (6), are difficult to diagnose, even by professionals, because of the complex and secretive nature of the problem. This survey reflects the knowledge of athletics administrators, who are not medical experts, in recognizing this problem. Therefore, the numbers reported in this survey are

Table 1. Eating disorders (ED) in NCAA intercollegiate women's sports (810 reports)

Sport	Sponsoring Schools	Schools Reporting ED	% Sponsoring Schools Reporting ED
Gymnastics	108	52	48%
Cross Country	642	146	23%
Swimming (only)	395	83	21%
Track (running events only)	537	111	21%
Basketball	762	101	13%
Soccer	293	37	13%
Field Hockey	219	27	12%
Volleyball	716	84	12%
Lacrosse	119	13	11%
Softball	556	53	10%
Skiing	39	3	8%
Tennis	694	58	8%
Golf	143	10	7%
Diving (only)	395	22	6%
Track (field events only)	537	10	2%
Fencing	49	0	0
Rifle	54	0	0

probably a conservative estimate of the prevalence of anorexia nervosa and bulimia.

In addition, 39 percent of the population did not respond to the survey. It is quite likely that several of these non-responding institutions have experienced an eating disorder in their athletics program, supporting the suggestion that these data may reflect minimal values.

The higher prevalence of eating disorders in women's sports is similar to reports of eating disorders by gender in other populations (1,5,7,13). However, it is important to note that eating disorders are not exclusively a women's problem. Sixty-two reports of eating disorders were reported in men's sport categories in this survey.

Gymnastics and distance running are two sports in which lighter physiques are considered necessary for optimal appearance and performance (13,14). Rosen et al. (11) and others (3,8,10) have reported a high prevalence of pathogenic weight control techniques in women participating in these two sports. The data in the present study substantiates this previous work by indicating that almost one-half of the NCAA institutions sponsoring women's gymnastics and more than 20 percent of the schools sponsoring women's cross country and women's track programs reported at least one athlete with an eating disorder. In addition, over 40 percent of the reports associated with men's programs occurred in the sports of cross country, gymnastics, and track.

Wrestling is the only sport surveyed in which a defined weight must be met in order to participate. Athletes often use a variety of aggressive methods to control or lose weight

during a season (12). These behaviors are not necessarily related to image or improving performance; if a wrestler does not make weight, he does not wrestle. Wrestling is the primary men's sport in which eating disorders have been reported (4,12); such results are supported by the data in this study. However, because of the unique weight demands of the sport, it is extremely difficult to differentiate between typical behaviors used to make weight and actual eating disorders. These behaviors may or may not continue beyond the competitive seasons, adding to the difficulty of an eating-disorder diagnosis. Further research is needed to better establish the prevalence of eating disorders in the sport of wrestling.

Eating disorders are often an expression of an underlying emotional distress that may develop long before the individual becomes involved in athletics. It had been suggested that stress, whether it be from participating in athletics, striving for academic success, or pursuing social relationships, may trigger psychological problems such as eating disorders in susceptible individuals (9). Therefore, it is difficult to focus on participation in a particular sports as a "cause" for an eating disorder.

While there are sports in which athletes appear to be at higher risk for the development of this problem, anorexia or bulimia were reported in 11 of 20 men's sports and in 15 of 17 women's sports categories in this study. Among these were sports, such as football and field events, where optimal performance is not generally associated with light physique. It should be recognized that individuals susceptible to eating disorders may participate in a variety of sports.

This study has shown that eating disorders are a major concern in intercollegiate athletics programs. While the data were collected from athletic administrators who are not experts in diagnosing these disorders, even the "perception" of a problem justifies the need for education about this topic for administrators, athletic trainers, medical personnel, coaches, and athletes. An eating disorder is a serious medical problem that may produce few obvious symptoms. Special emphasis should be placed on an understanding of the underlying causes, an awareness of the warning signs, a knowledge of the physical and psychological effects of the disorder, and an understanding of how to handle a problem if one develops.

Athletic trainers are often in a position to initiate such education. Those working with sports programs at all levels are encouraged to take the lead in organizing a multidimensional network for addressing eating disorders prior to the development of a problem. A network, including nutritionists, athletic trainers, other medical personal, and coaches and administrators, may be the best tool against a problem that continues to affect a significant number of athletic programs.

CONCLUSIONS

Eating disorders, specifically anorexia nervosa and bulimia, are a significant concern in intercollegiate athletics. Almost 40 percent of NCAA institutions reported at least one eating disorder case within their athletics programs between 1988 and 1990. Because of the complex and secretive nature of the problem, the prevalence may actually be much higher.

Eating disorders are significantly more prevalent in intercollegiate women's programs; 93 percent of all reports were in women's sport categories. However, this study also demonstrates that eating disorders are not exclusively women's problems.

Eleven of twenty men's sport categories reported at least one occurrence of an eating disorder. The sports of wrestling, cross country, gymnastics, and track had the greatest percentage of sponsoring schools reporting a problem.

Fifteen of seventeen women's sport categories reported at least one athlete with an eating disorder. The sports of gymnastics, cross country, swimming, and track had the greatest percentage of sponsoring schools reporting a problem.

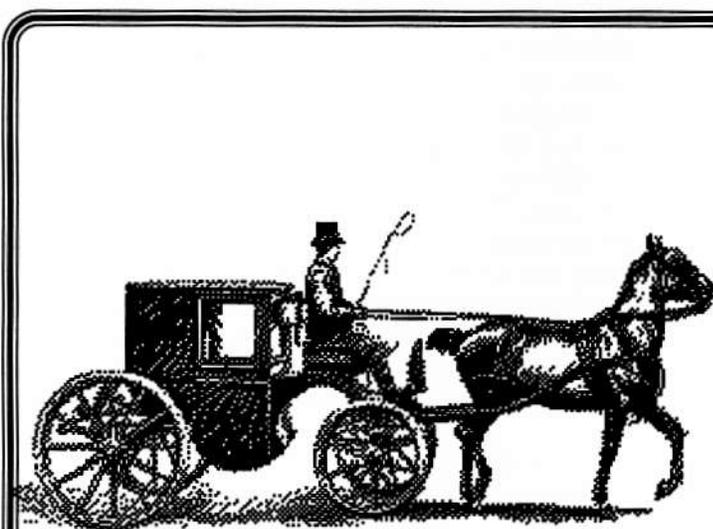
Eating disorders were reported in a wide range of sports, including several that are not traditionally associated with the problem. Although some sports may be at more risk, no sports should be considered "exempt" from having individuals susceptible to eating disorders.

Education is an important tool in combatting the problem of eating disorders. Athletic administrators, athletic trainers, medical personnel, coaches, and athletes should each be well informed about this topic prior to the advent of a problem.

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Nutritional Aspects of Eating Disorders: Nutrition Education and Counseling as a Component of Treatment

Glenda Woscyna, MS, RD, CN

ABSTRACT: Treatment of anorexia nervosa and bulimia nervosa is often an interdisciplinary process. This article describes the part that a clinical nutritionist (registered dietitian) plays on an interdisciplinary treatment team, emphasizing the role in counseling vs. the role in management of weight and diet. Food fears are intense but often presented as food dislikes. The nutrition education and counseling process addresses the emotional distress and irrational thoughts toward food and weight. Through effective individual and group counseling, the patient is able to identify fears, to plan more rational approaches toward diet, and eventually to achieve self-management of a healthy diet and weight. It is emphasized that anorexia nervosa and bulimia nervosa are psychological disorders with weight and diet management implications.

The term "eating disorder" is frequently used to characterize anorexia nervosa, bulimia nervosa, and other practices such as fad dieting, the abuse of diet pills, and sporadic binge-purge behaviors. For the purpose of this study, the term eating disorder refers to anorexia nervosa and bulimia nervosa. This paper will not attempt to report research, but will describe anecdotal treatment findings that allow the nutritionist to understand the dynamics of an eating disorder and to apply effective counseling strategies.

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Anorexia nervosa is characterized by severe weight loss, intense fear of becoming overweight, distorted body image, and amenorrhea. Bulimia nervosa is characterized by recurrent binge-eating, fear of inability to stop eating, and purging. A minimum average of two binge-eating episodes per week for at least three months is a criterion for diagnosis (1).

Treatment of anorexia nervosa and bulimia nervosa is frequently described as multi-dimensional or inter-disciplinary. The literature describes the various practitioners represented on the treatment team. Frequently included are psychologists, social workers, nurses, and nutritionists (3,8,10,12). Treatment incorporating pharmacology, psychotherapy, and nutrition counseling has been described in the literature for both disorders (3,4,5,7,8,9,10,11,12,13).

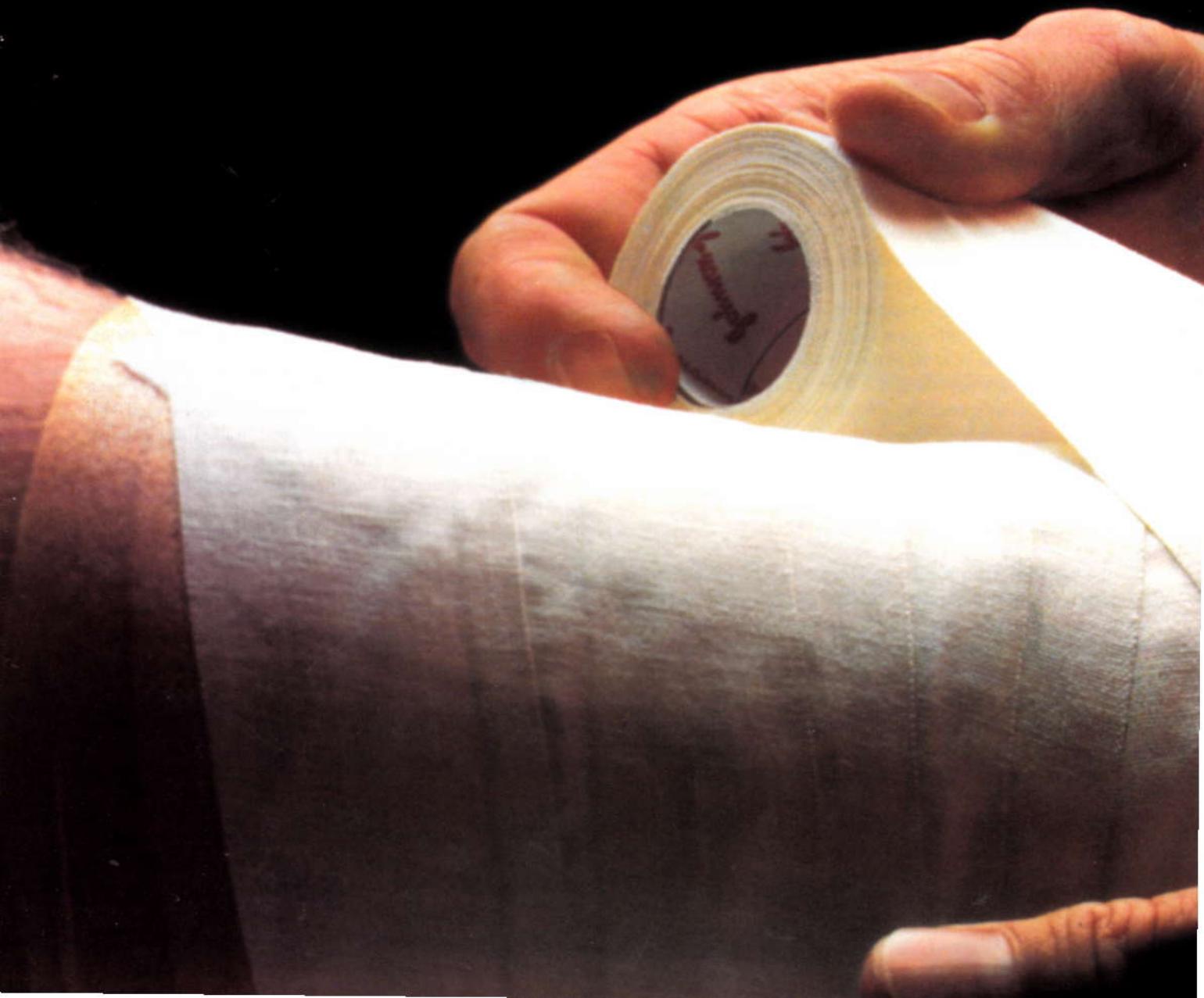
Restoring nutritional health, regulating eating patterns, and achieving weight gain (for anorexia nervosa) are generally considered essential and should occur concurrently with psychotherapy (3,4,5,7,8,9,10,11,12,13). To work effectively with patients who have eating disorders, a thorough knowledge of both anorexia nervosa and bulimia is essential (7,8,13). It is also essential to empathize with the patient.

Patient feedback describing subjective evaluation of specific nutrition education and counseling components has been described in a separate report. All treatment components were assessed as helpful or very helpful by 69% to 86% of patients completing treatment (14).

TREATMENT OVERVIEW

At the University of Nebraska Medical Center (UNMC), assessment and treatment are provided by an interdisciplinary team consisting of a physician, psychotherapist, and clinical

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nutritionist (registered dietitian). The physician monitors the patient's medical condition and supervises overall treatment. The psychotherapist focuses on underlying issues and family and peer relationships, as well as body image and eating disordered behavior. The nutritionist addresses diet and weight issues, body function, and disordered eating patterns, and co-facilitates body image group therapy. Figure 1 illustrates the interdisciplinary focus of nutrition education/counseling and psychotherapy in the UNMC treatment process. Treatment goals are identified in Table 1.

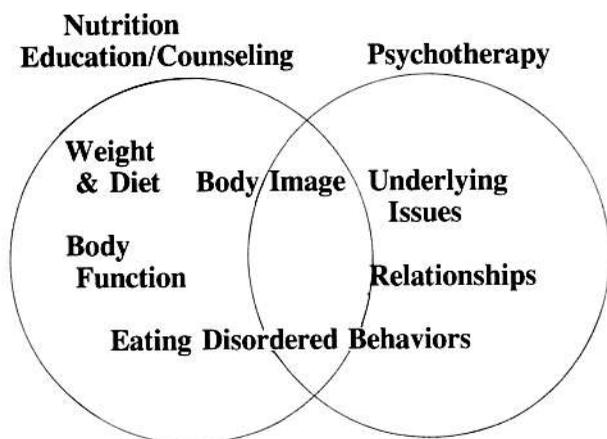


Figure 1. Interrelationship between nutritionists and psychotherapists in treating elements of eating disorders

Outpatient treatment is always preferred and is generally successful in treating normal weight patients with bulimia nervosa. Indications for in-patient care include emaciation, acute psychological distress, medical complications, and lack of progress in outpatient care (14).

Weight gain is the first priority in treating a patient with anorexia nervosa, because many of the presenting symptoms are secondary to starvation. This condition must be reversed before the patient can benefit from psychotherapy or nutrition counseling (6). A rate of gain of 1 to 1.5 kg (2 to 3 lbs) per week is promoted until the patient achieves the goal weight. The goal weight is based on weight graphs, growth charts, and personal history. Once the patient has reached goal weight, weight stabilization on a free choice diet is a primary treatment goal. This stabilization is the focus from the beginning for a normal weight, bulimic patient. Responsible use of

Table 1. Treatment goals

- Medical and nutritional stabilization
- Self-management of diet
- Maintenance of medically safe weight and resumption of normal biological functions, e.g., menses
- Increased tolerance/acceptance of body weight and shape
- Ability to identify sources of and to deal directly with anxiety, anger, and depression in ways that are not self-destructive

weight data is an issue throughout treatment and is dealt with in a straightforward manner. Patients learn that the problem is not the data itself, but their inappropriate interpretation of it, which results in destructive behaviors such as starvation level intake or bingeing and purging.

During the first several weeks or months of treatment, most patients devote a staggering amount of emotional energy to food and fear of fatness. One former patient allowed review of a diary kept during the first ten months of treatment. In her diary, the patient estimated that 85% of her total energy was consumed with trying to keep the eating disorder under control.

NUTRITION EDUCATION AND COUNSELING

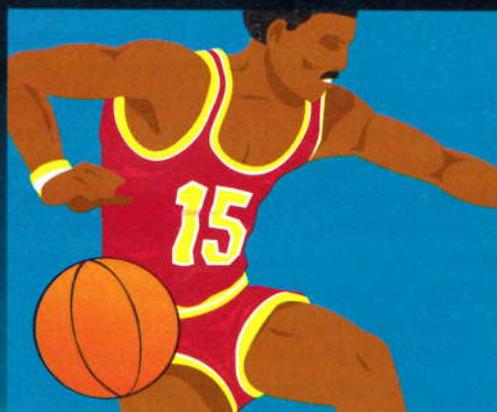
The nutrition education and counseling component encompasses a variety of topics during the treatment process (Table 2). Each of the topics could seemingly be addressed through brief educational sessions or print materials. However, patients are not merely uninformed regarding issues such as body function, energy needs, and eating disorders, but often are very distrustful of their own bodies and of information presented to them. It is essential to openly address fears and to assist patients in interpreting nutrition information. New behaviors must be tried, based on factual information, to gradually conquer food and weight-related fears.

Table 2. Nutrition education and counseling treatment components

Body Function	Dietary Guidelines
Energy Needs	Energy Nutrients
Hereditary Factors	Purposeful Data Recording
Purposeful Exercise	Estimating Portions
Realistic Goals	Normalizing Meal Behaviors
Fluid Balance	Food Risks
Female Physiology	Routine Eating Patterns

Food fears are generally intense. Whole categories of foods often have been eliminated, resulting in a diet that consists solely of vegetables, fruits, rice cakes, and diet sodas. Previously enjoyed foods such as pizza, sandwiches, or ice cream are forbidden or become binge foods, which, when consumed, cause guilt followed by purging. Undesirable qualities of forbidden foods have been transformed to powerful, negative, visual images. A high fat food may be visualized literally as fat applied directly to the hips. Because of these emotions, patients often claim to "not like" most of the foods they refuse to eat. As they describe their avoidance of certain foods during the initial dieting and onset of the disorder, we can distinguish which foods they previously

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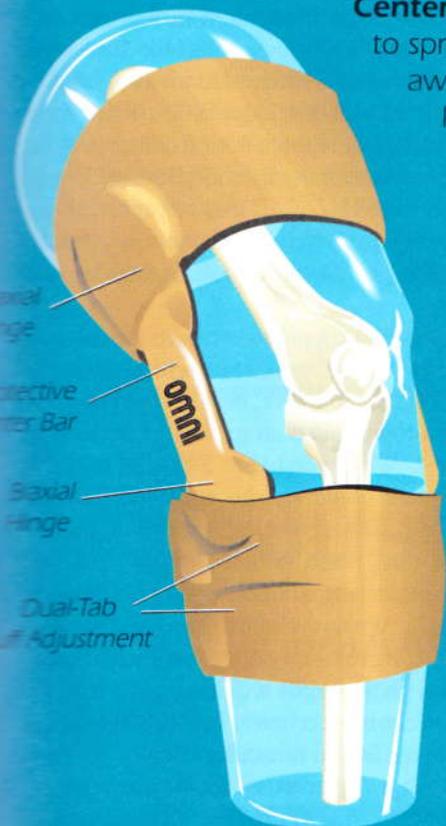


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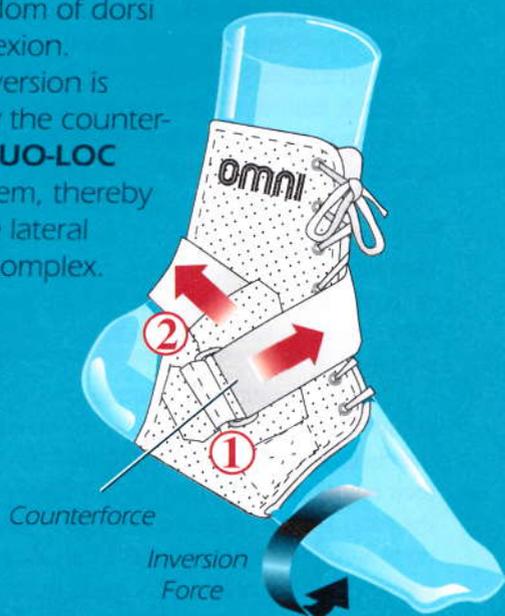


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enjoyed but now deny themselves because of fat or calorie content.

For some patients, initial treatment requires hospitalization or meal consumption at the hospital as an outpatient. During this phase of treatment, patients often are very anxious about the meals that they must consume. Because they perceive the foods as high in calories, they are not allowed to observe the food preparation, and they are not given the opportunity to refuse many foods. We do, however, often detect a degree of relief that someone else has taken control and is making the selections. At this stage in treatment, patients usually are not able to select an adequate diet, because it would blatantly violate the self-imposed rules regarding when and what they may eat or drink. This combination of events allows us to help patients separate foods that they really don't like from foods that they used to enjoy, but now fear. We prioritize levels of fear and make a plan for gradually reintroducing foods that were previously enjoyed.

We actively listen to the perceptions, fears, and knowledge of the patient regarding any topic that emerges in the course of nutrition counseling. We then provide relevant factual information for the patient's consideration. Our experience has been that group interaction is particularly valuable, because the patients share their ideas and fears, and they learn from each other. Often patients are able to trust each other before they are able to trust a staff member.

In addressing food fears, the nutritionist deals directly with the question, "How does a person with an eating disorder view food?" Following a generalized group discussion of "safe" foods and "scary" foods, patients create a picture of the images that appear in their minds when we suggest that they have a "hamburger and fries" for the next meal. Patients are often more readily able to express emotion through structured activities than through verbalization. Collages, drawings, and poems are generated, which reveal intense anxiety, fear, and anger directed toward perceived qualities of foods, and also toward their own rigidity, fear, and conflict around food and weight issues. They fear the calories and fat in the hamburger and fries, but are torn by the desire to be able to eat without worry. The fear usually wins, causing them to avoid these foods, or to feel forced to punish themselves if they do eat them.

Eating becomes an emotional battle, because to eat seems weak, but the fear of eating seems just as weak. Using the visuals or writings, patients begin to effectively verbalize their emotions relating to food. Then they can start to assess the basis for the reaction, and identify other preferred reactions and potential outcomes of an alternate response, e.g., eating the scary food. This leads to actually trying a hamburger and fries, as a shared activity, with the nutritionist or another patient.

BODY IMAGE

Body dissatisfaction and body image distortion represent treatment challenges that directly affect food issues. The nutritionist and therapist work together to help patients address body image issues. Group activities include drawing, putting

together collages, writing and reading poems, showing childhood photographs, and role playing.

Patients write letters to their bodies followed by a response letter from their bodies. Letters to their bodies may include statements such as, "I hate the way you control how I feel about myself." Response letters, as patients imagine how their bodies perceive their eating disordered behaviors, often reflect more logical information with statements such as, "I don't think you realize how hard I have to work just to do the job I was meant to do (digestion). You didn't make it any easier with your starving, or binging, or purging. Just who do you think you are to play around with me like this? The least you could do is give me some time to get back into good working order. And one more thing, where did you ever get the idea that I was meant to be flat? No one (really) has a flat stomach. Just remember to use your brain to think logically, and we'll both be happier and healthier. Remember, I'm not the enemy!!!" Letters such as this reflect not only patients' fears, but also their efforts to practice and believe the knowledge and skills learned through nutrition counseling and psychotherapy.

Drawings illustrate patient perceptions of "how I look, how I think others see me, and how I want to look." In groups, patients review each of the drawings and help identify the apparent distortion in how they perceive their own bodies. Despite their distorted self-images, patients are able to give accurate feedback to each other.

The ever changing cultural standards of beauty are also reviewed and analyzed. Patients discover that the desired female physique provided a voluptuous, perhaps rotund look from roughly 1500 to 1900, a time when girth correlated directly with health and wealth. A corseted, frail look appeared during the 1800s, but it did not dominate. Ampleness remained the desired look until the 1900s, when food shortages became a lesser fear and the notion of carrying fat reserved for emergencies became passe. Following World War II, designers again brought corsets into vogue creating a silhouette with rounded shoulders, full and feminine breasts, small waists, and full hips. Marilyn Monroe became the symbol of the fifties.

In the sixties, liquid diet supplements were introduced, and Twiggy, reported to be 5' 6^{1/2} inches tall, with a weight of 90 lbs and measurements of 31-22-32, became the feminine ideal. This idolization represented an extreme, but is often cited as a turning point. We began to see a slimming of the preferred body—one that could not be achieved through padding and corseting. The seventies' models appeared significantly slimmer than those of the fifties. And our cultural focus on ever-increasing slimness continued through at least the mid 1980s (2). We now claim to have become less focused on slimness and increasingly concerned with health and fitness. Magazine photographs would suggest that we may have merely added one more criteria. In addition to being slim, we must now have a fit and muscular body.

Patients make collages expressing the messages they receive from current media. These provide valuable insight regarding the intense pressure they feel to conform, and the limited degree to which they have questioned the validity of

media messages. By using information from magazines and other current media, patients are able to deal with very real issues that have become wrapped up in their eating-disordered behavior. They identify new ways to respond to stimuli—ways that allow them positive self-reinforcement. They learn to reject some of the information presented in the media, instead of trying to be everything that others seem to suggest they should be.

Sorting through messages about weight and shape that are received from peers, family, the media, and society helps patients assess the demands they place upon themselves. Assessing external messages allows patients to rethink and adjust internal demands, by incorporating new information about their bodies, minds, intrinsic value, and significance as human beings.

It is the intent of these examples to illustrate the patient's intense emotional distress and irrational thoughts toward food and weight. Anorexia nervosa and bulimia nervosa are not weight-management problems; they are psychological disorders with weight and diet management implications.

Nutrition counseling, to be considered successful, must change behavior. The nutritionist and psychotherapist must work together to assure that progress is achieved in addressing underlying emotional issues, eating disordered behaviors, and weight management issues. Through this process, self-management of weight and diet can be achieved and treatment goals can be met.

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ORAL PRESENTATIONS

A NATIONAL SURVEY OF ATHLETIC TRAINER ROLES AND RESPONSIBILITIES IN THE ALLIED CLINICAL SETTING

Duncan KM, Wright KE: DCH SportsCare and The University of Alabama, Tuscaloosa, AL 35401

This study assessed the current levels of competency, the job roles, and the responsibilities of certified athletic trainers employed in the allied clinical setting. Data were collected via a survey instrument mailed to all NATA Allied Clinical Setting Directors. Surveys were returned by 127 respondents representing 70.5% of the sample. The topics examined in the data included specific roles and responsibilities of certified athletic trainers who were employed in an allied clinical setting. Regarding job responsibilities of the clinical ATC, the breakdown of time spent in daily activities consisted of the following: treatment of athletic injuries in the clinic (25%), on-site coverage of athletic events (35%), and other responsibilities including patient care, public relations, education, and program development (40%). Over 92% of the medical coverage provided to schools and community athletics was arranged on a part-time basis. Financial sponsorship of this coverage is provided primarily through a contract with the school (58%), a free service from a clinic (34%), or other means (8%). Seventy percent of the clinics that indicated some type of governmental licensure in their state cited no specific regulations for athletic trainers employed in the clinical setting. Skills and services provided by the clinical ATC that were rated as very important were: evaluation, prevention, and rehabilitation/reconditioning of athletic injuries. Competency regarding recognition and evaluation received the highest relative importance score, which is consistent with the findings of the 1982 NATA Role Delineation Study. Educational preparation through NATA-approved curricula had the highest importance in professional preparation for a career in athletic training. Results from this study support previous findings of the 1982 NATA Role Delineation Study, but additional research that addresses the levels of competency, the job roles, and the responsibilities of the clinical athletic trainer needs to be completed.

PERFORMANCE EVALUATION IN ATHLETIC TRAINING: PERCEPTIONS OF ATHLETIC TRAINERS AND THEIR SUPERVISORS

Ray RR: Hope College, Holland, MI 49423

Three research questions were investigated in this study: 1) What is

the status of performance evaluation as practiced within the profession of athletic training? 2) Do athletic trainers and persons who supervise them share common perceptions regarding the status of performance evaluation in athletic training? 3) Do athletic trainers who work in the four major employment settings share common perceptions regarding performance evaluation? A proportional, stratified random sample was selected from the population of all NATA certified athletic trainers practicing in the United States. The athletic trainers selected for inclusion in the study were asked to recruit their supervisors as subjects for the study. Data collection was accomplished using a separate but similar 55 item questionnaire for both athletic trainers and supervisors. Questionnaire items were designed to compare actual performance evaluation practices in athletic training with those recommended by the NATA Joint Committee on Standards for Educational Evaluation. Four conclusions were inferred: 1) Evaluation systems for athletic trainers are deficient in propriety, accuracy, utility, and feasibility; 2) Athletic trainers and their supervisors share few perceptions in common with regard to performance evaluation; 3) Evaluation systems used in sports medicine clinics are more proper, accurate, useful, and feasible than those used in other employment settings; and 4) Evaluation systems used in colleges and universities contain the fewest elements of propriety, accuracy, utility, and feasibility.

RELIABILITY OF THE DYNATRAC ISOTONIC DYNAMOMETER FOR THE MEASUREMENT OF QUADRICEPS MUSCLE POWER

Timm KE, Fyke D, Vasilenko P: St. Luke's Sports Medicine Center, Saginaw, MI 48602

This study determined the reliability of the Dynatrac isotonic dynamometer for the measurement of quadriceps muscle power. The device is a relatively unstudied clinical instrument that measures muscle power as a combined product of both concentric and eccentric muscle actions under a situation of controlled inertia. In a test/retest paradigm, 18 subjects (9 females, 9 males; age=24.2 ± 7.1 yrs; age range=15 to 33 yrs) were tested for quadriceps function in a randomly assigned order. The trunk and the pelvis were stabilized; and the ipsilateral hip was maintained at 90° flexion. Testing involved a warm-up of three gradient submaximal repetitions of a knee flexion/extension motion followed by one maximal effort before the performance of five maximal test repetitions at a work setting of 2000 joules under a load of 50 Newtons. The exact protocol was repeated precisely one week later under the test/retest format. Data on quadriceps muscle power (watts) were collected on the device's computer system and were subjected to Pearson correlation and two-tailed t-tests (p=.05) for statistical analysis. Results

revealed a strongly positive correlation coefficient of 0.912 and the absence of a significant difference between test sessions ($t = 0.216$, critical $t = 0.830$). The null hypothesis that no difference would exist between the test and retest sessions was not rejected. It was concluded that the Dynatrac demonstrated a high level of test/retest reliability for the measurement of quadriceps muscle power under a situation of controlled isotonic muscle loading. This information has important implications for athletic trainers who may wish to incorporate computerized isotonic testing into their programs.

Grant support was provided by Comfort Care, Inc., Flint, MI.

INFLUENCE OF HIP POSITION, MUSCULAR CONTRACTION AND JOINT RANGE OF MOTION UPON ELECTRICAL ACTIVITY AND TORQUE PRODUCTION IN THE KNEE **Black SJ, Woodhouse ML, Suttmiller S, Callis M, Shall L: Exercise Science Laboratory, Norfolk State University, Norfolk, VA 23504**

During this study, the effects of hip position and muscular contraction on torque and electrical activity as measured by an electromyograph (EMG) were evaluated in the hamstring and quadriceps. Twelve male and 12 female subjects ($ht = 173.5 \pm 7.3$ cm, $wt = 74 \pm 13.1$ kg, $age = 22 \pm 3.8$ yrs) volunteered to participate in this repeated measures study. Subjects were tested isokinetically (Kin Com[®]) at 30 degrees/s in upright and supine positions both concentrically and eccentrically during knee flexion and extension. Gravity corrected torque values (Nm) were obtained for all tests. EMG output (mV) was collected using surface electrodes. Data were analyzed by factorial MANOVA for main effects and interactions followed by separate univariate ANOVA and tukey post hoc tests ($p < .05$). Isokinetic torque and surface electrical values were significant for gender, knee flexion/extension, and muscular contraction. Significance was also noted for torque during hip position as well as for the interactive effects of gender/knee motion and knee motion/hip position. Torque values were significantly greater for knee flexion in the upright position when compared with the supine position. No hip positional changes were noted for torque or electrical activity testing during knee extension either for upright or supine values. Results indicate significant positional advantages of upright versus supine positions relative to torque productions of the hamstrings during isokinetic knee flexion.

HYDRAULIC RESISTANCE CHARACTERISTICS OF THIGH MUSCULATURE IN FEMALES

Russell JA, Laseter JT: Joe W. King Orthopedic Institute, Houston, TX 77030

This study was conducted in order to characterize females' thigh muscle function in hydraulic resistance exercise. Twenty-three healthy female subjects ($age = 28.7 \pm 6.5$ yrs) underwent quadriceps and hamstring testing on a Hydra-Fitness OmniTron knee apparatus. None had ever sustained knee injury. Height and weight data were obtained for each subject; then, following a warm-up, each subject performed a four repetition OmniTron test of maximal effort knee extension and flexion at setting #10 (high resistance, slow speed). The contralateral side also was tested; the order of testing was randomly assigned. After a five minute rest, the test protocol was repeated. Peak torque, power, and work values were collected for each repetition. The second test's data were used in our analyses in order to counteract any learning effect. The data from the first repetition of each test were discarded and the remaining three trials were used to calculate extension and flexion mean peak torque, power,

and work for each subject. Paired t-tests suggested that torque values in the right limb were not significantly different from corresponding values in the left limb. The extensor/flexor torque ratio was 1.42 ± 0.24 . A Pearson product moment correlation matrix was used to assess relationships between different variables. Peak torque, power, and work were all highly correlated with one another (all three correlations were greater than .81). Flexion torque was fairly well correlated with height ($r = .72$), but extension torque was not ($r = .56$). Neither extension nor flexion torque were related to weight or body mass index. Mean squares from a repeated measures ANOVA on both tests' data were used to calculate intraclass reliability of the OmniTron. The reliability coefficient estimate was .97 and the standard errors of measurement (SEMs) were 2.06 Nm for extension and 2.30 Nm for flexion. The OmniTron appears to be very reliable. Our study results suggest that right/left strength differences are non-significant and that quadriceps/hamstrings torque ratios are within normal limits. Hydraulically measured thigh strength seems to be more closely related to height than to body weight or body mass.

RELATIONSHIP BETWEEN SPRINT SPEED AND HIP FLEXOR/EXTENSOR STRENGTH IN DIVISION I INTER-COLLEGIATE FOOTBALL PLAYERS

Guskiewicz KM, Lephart SM, Burkholder R, Feld F: Sports Medicine Program, University of Pittsburgh, Pittsburgh, PA 15261

Previous investigators have unsuccessfully attempted to establish strong relationships between quadriceps/hamstring strength and sprint speed. More contemporary research has established that: 1) the hip and the hip flexors are the strongest muscle groups within the lower extremity; and 2) the extensors are the primary movers by acceleration of the body's center of gravity. This study was done to determine the relationship between hip flexor/extensor strength and sprint speed, and to establish if selected strength variables can be employed to predict sprint speed. Twenty Division I intercollegiate football players (mean age = 19.4 yrs, mean wt = 217.85 lbs) participated in this study. Sprint speed (SS) was determined from the mean of three 40 yard sprints on Astroturf. Muscular assessment was performed using a Cybex II isokinetic testing device. Test speeds of 60°/sec and 240°/sec were selected for assessment of peak torque (PT), torque acceleration energy (TAE), peak torque/body weight (PT/BW), average power, flexion/extension ratios, and endurance ratios. Subjects were positioned in a functional standing position for right leg testing. Results of regression analysis revealed significant correlations between SS and flexion PT/BW at 60°/sec ($r = -.62$), extension PT/BW at 60°/sec ($r = -.57$), and flexion PT/BW at 240°/sec ($r = .46$). A stepwise regression analysis revealed that flexion PT/BW at 60°/sec and flexion PT at 60°/sec were collectively the best predictors of SS ($r = .867$). The subjects were placed in three groups based on significant ($p < 0.05$) differences in SS (group 1 \bar{x} SS = 4.6, group 2 \bar{x} SS = 5.2, group 3 \bar{x} SS = 5.69) for the final analysis to determine differences in strength variables between the groups. ANOVA revealed significant ($p < 0.05$) mean differences between all groups for extension on PT/BW at 60°/sec, significant ($p < 0.05$) group 1 and group 3 mean differences for flexion PT/BW at 60°/sec, and significant ($p < 0.05$) group 1 and group 3 mean differences for flexion PT/BW at 240°/sec. This study suggests that there is a strong relationship between sprint speed and hip flexion and extension strength relative to body weight in football players. Additionally, it appears that the use of isokinetically obtained values of hip strength can be used to predict sprint speed. Further, the data suggests that enhanced hip flexion strength and hip extension strength may result in faster sprint speed.

THE EFFECT OF WARM-UP CONTRACTIONS ON CONCENTRIC AND ECCENTRIC ISOKINETIC TORQUE VALUES OF THE QUADRICEPS

Dolan MG, Reeds GK, Richetelli DC: Department of Physical Education, Canisius College, Buffalo, NY 14208

This study was done in order to determine the effect of submaximal and maximal warm-up contractions on peak and average torque values of concentric and eccentric isokinetic testing of the quadriceps. Twenty-eight students (age=19.0 ± 1.17 yrs; ht=178.3 ± 5.0cm; wt=79.36 ± 13.59kg) with no previous history of knee injury served as subjects. Prior to testing, each subject attended an orientation session that described the purpose of the study and acquainted them with concentric (CON) and eccentric (ECC) contractions of the isokinetic dynamometer (Kin-Com, Chattecx Corp.). Each subject reported for two test sessions. Test session number one consisted of a warm-up of three minutes of stationary bike riding followed by three minutes of static quadriceps and hamstrings stretching. Subjects then performed three submaximal concentric and eccentric warm-ups on the Kin-Com at 60° per sec. The test results were gravity corrected as per manufacturer guidelines, and were tested from 90 to 0 degrees of knee motion for the quadriceps muscle group. Test session number two consisted of the same warm-up procedure with the exception of the addition of one maximal warm-up contraction following the three sub-maximal contractions. Peak torque and average torque values in Newton meters (NM) were obtained for each subject for both test sessions. The data were analyzed using the Wilcoxon t-test to determine if the subjects differed in the two performance conditions. Each subject served as his or her own control in this research design. Results indicated a statistically significant decrease in torque values when a maximal contraction was included in the warm-up. CON peak torque produced a net gain of 144NM ($\bar{x}_1=218.2 \pm 34.2\text{NM}$, $\bar{x}_2=210.9 \pm 37.5\text{NM}$ $p<.05$). ECC peak torque produced a net gain of 133NM ($\bar{x}_1=264.4 \pm 47.3\text{NM}$, $\bar{x}_2=253.4 \pm 57.0\text{NM}$ $p<.05$). CON average torque produced a net gain of 256NM ($\bar{x}_1=142.0 \pm 24.0\text{NM}$, $\bar{x}_2=130.5 \pm 23.4\text{NM}$ $p<.001$). ECC average torque produced a net gain of 237NM ($\bar{x}_1=184.4 \pm 31.0\text{NM}$, $\bar{x}_2=166.9 \pm 30.4\text{NM}$ $p<.001$). These results suggest that a warm-up of submaximal contractions is most suited to maximizing isokinetic performance.

A COMPARISON OF VALUES OBTAINED FROM THE CYBEX II AND KIN-COM II ISOKINETIC DYNAMOMETERS FOR PEAK TORQUE AND MUSCULAR ENDURANCE

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Clinicians have traditionally used values obtained from the Cybex II Isokinetic Dynamometer and the Kin-Com II Isokinetic Dynamometer interchangeably as a quantitative means of comparing muscle function and injury rehabilitation. Currently there is little research available that substantiates that the data produced by these two devices can be used interchangeably. This study was done to determine if values obtained on the Cybex II and the Kin-Com II isokinetic testing devices are similar, thus allowing interchangeable use of the obtained data. Ten men (mean age = 24.1 yrs, mean ht = 71.3 in, mean wt = 175.9 lbs) who had no previous history of knee injury were tested randomly for knee flexion and extension peak torque (PT) and endurance at 60°/sec and 180°/sec on both the Cybex and the Kin-Com. Subjects performed four maximal repetitions at 60°/sec to obtain peak torque values. Each subject then performed repeated flexion/extension repetitions at 180°/sec until such time that the quadriceps torque values dropped below 50% of the torque

generated during the first repetition. The total number of repetitions completed during the test was used for the index of endurance. Paired t-test analysis revealed that the Cybex provided significantly ($p<0.01$) greater values than the Kin-Com for hamstring PT (88.14 ± 20.18 ft lbs; 68.89 ± 17.47 ft lbs), and PT ratios (73.14 ± 8.75 ft lbs; 57.71 ± 10.6 ft lbs) at 60°/sec. Additionally, the mean number of repetitions performed on the Kin-Com endurance test (n=45) was significantly greater than the mean number of repetitions performed on the Cybex endurance test (n=34). There was no significant mean difference for quadriceps PT between the two devices. The results of this study indicate that PT assessments at 60°/sec for knee extension may be used interchangeably between the Cybex II and Kin-Com Isokinetic Dynamometers. Thus it appears that the two devices measure similar characteristics relative to the maximal force generated when starting from a resting knee-flexed position. Knee flexion values do not appear to be similar, which presumably is the result of the protocol discrepancies that do not allow for reciprocal innervation and the transfer of momentum from extension to flexion on the Kin-Com. Finally, the interchangeable use of the two devices for endurance testing is limited by the lack of protocol for the Kin-Com. The use of the Cybex endurance protocol for testing on both devices does not appear to provide similar results.

RELIABILITY AND VALIDITY OF THE STABILITY TESTING AND REHABILITATION (STAR) STATION

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Forty-six subjects (13 males, 33 females, mean age=20.8 yrs, mean ht=167.3 in, mean wt= 146.6 lbs) participated in an experiment in order to determine the test-retest reliability and validity of the Stability Testing and Rehabilitation (STAR) station (Camp International, Inc., Jackson, MI). Validity was determined by examining the relationship between the STAR station and field tests of agility and balance (stork stand). The STAR station protocol included performing three frames of rotation on the left and right extremities (one external and two internal for each side) at two levels of difficulty. The values examined included average force about the periphery of the platform, average velocity at which the platform was rotated, and percentage of the total force sensing switches contacted (touch down density). The agility test included running a figure eight pattern around two pylons that were placed ten meters apart. Balance was assessed via a standard stork stand test. Values in seconds for the agility and balance tests were reported as an average of three trials. Test-retest reliability coefficients for STAR station force revealed a range of $r=.74-.90$ ($\alpha=.88$) and $r=.51-.80$ ($\alpha=.68$) for left and right sides respectively. Reliability coefficients for left and right velocity ranged from $r=.76-.81$ ($\alpha=.78$) and $r=.71-.83$ ($\alpha=.75$) respectively. When force values were computed from touch down density values greater than 80%, the ranges of reliability increased to $r=.77-.91$ and $r=.76-.79$ for left and right sides respectively. Test-retest reliability for the agility run was $r=.91$; for the balance test reliability was $r=.76$ and $.87$ for the left and right sides, respectively. Examination of the relationship between the agility run and left and right side force revealed coefficients of $r=.43$ and $-.40$ respectively. Coefficients between the agility run, and left and right side velocity were $r=.09$ and $.08$ respectively. The coefficients between the left side balance test and left side force and velocity were $r=.25$ and $-.22$, respectively, and between right side balance and right side force and velocity were $r=.14$ and $-.26$ respectively. These findings suggest moderate reliability in assessment of force and velocity on the STAR station, and that reliability of these measures is increased with increases in touch down density. The negative

relationship found between the agility run and left and right side force suggests that the STAR station may measure some component of lower extremity performance. However, the strength of these coefficients suggests that further research is needed to identify the components of function being assessed by the STAR station.

KT-1000 ARTHROMETRY IN THE DIAGNOSIS OF ANTERIOR CRUCIATE LIGAMENT RUPTURE

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Evaluation of anterior cruciate ligament (ACL) injuries is based on clinical history and physical exam. Ruptures of the ACL result in increased anterior laxity of the knee; the examiner subjectively determines this translation with the Lachman exam. Some athletes are able to disguise their laxity with either very tight secondary anatomic structures or by guarding with the hamstrings. An instrumented objective measurement device to rule out subjectivity could help the examiner in the accurate diagnosis of ACL rupture. This study was done in order to substantiate the use of instrumented ligament arthrometry as an adjunct to the diagnosis of ACL rupture. Fifty-two athletes (43 males, 9 females, age=23.7±7.8 yrs) with unilateral traumatic knee injuries and 13 control subjects (11 males, 2 females, age=27.1±11.2 yrs), with no history of knee pathology, were tested using a standard MEDmetric KT-1000 arthrometer system according to the manufacturer's prescribed installation and protocol. Force measurements of 15, 20, and 30 pounds, passive-maximum (PAS) and active-maximum (ACT), were performed on each subject while supine, using a thigh support to elicit 25° of flexion and a foot support to eliminate external tibial rotation during testing. Measurements were determined by the same technician to insure data consistency and optimal patient compliance. In this study, the criterion indicative of ACL rupture was any anterior translation >3mm of difference between injured and non-injured knees. ANOVA indicated a significant difference ($p<.01$) in ACL laxity between normal-normal knees (control) and injured-non-injured knees at 20 (1.4±.6 vs. 3.1±.3, $p<.01$), 30 (1.7±.8 vs. 4.4±.4, $p<.002$), PAS (1.2±.9 vs. 6.9±.5, $p<.0001$) and ACT (1.6±.8 vs. 4.7±.5, $p<.0014$) pounds of force. The KT-1000 ligament arthrometer provides objective criteria for comparing the anterior laxity of the injured knee to the non-injured knee. This instrumented method to determine anterior knee laxity may be used as an accurate adjunct in determining ACL injuries of the knee.

RELIABILITY OF KT-1000 KNEE ARTHROMETER DISPLACEMENT MEASURES OBTAINED AT THREE KNEE JOINT POSITIONS

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The KT-1000 knee arthrometer has been used to measure knee joint displacement at a flexion angle of 20 to 30 degrees. The reliability of the instrument has been established at this position of the knee. However, no studies have assessed its reliability at multiple joint positions. This study was conducted in order to determine intratester reliability of the KT-1000 at three positions (20°, 45°, and 90°) of knee flexion. Twenty subjects (11 males, 9 females, mean age=20.15 yrs, mean ht=170.38 cm, mean wt=71.55 kg) having no previous history of knee pathology participated in the investigation. The subjects were seated in an Orthotron KT, and the leg was statically positioned at each of the knee joint angles. A KT-1000 knee arthrometer (MED-

metric Corp., San Diego, CA) was positioned on the leg to measure anterior displacement of the proximal tibia at 20°, 45°, and 90° of knee flexion. The order in which the measurements were taken was randomly assigned. The KT-1000 was removed from the leg and repositioned for each of the three measurements. The average of the test and retest displacements was 6.93 mm (3.0-12.0) at 20°, 7.16 mm (4.0-11.5) at 45°, and 3.26 mm (1.0-5.5) at 90°. Analysis of variance indicated different displacement ($p<.05$) for the three joint positions (test 20° vs. 90°, Δ 3.8 mm; test 45° vs. 90°, Δ 4.0 mm; retest 20° vs. 90°, Δ 3.5 mm; retest 45° vs. 90°, Δ 3.8 mm). There was no significant difference between displacement at test and retest 20° vs. 45° measures. Pearson-product moment correlations for intratester reliability were identical for the 20° and 90° measurements ($r=.85$), but were less for the 45° measurement ($r=.73$). These findings suggest that the KT-1000 is a reliable instrument for measurement of displacement at knee joint positions other than the standard measurement (20° to 30°) commonly seen in the literature. Furthermore, the highest reliability coefficients were found at the extremes of position tested (20° and 90°), and a lower coefficient was found at the midpoint of position tested (45°).

ISOKINETIC EVALUATION OF PLANTAR FLEXION SYMMETRY FOLLOWING TWO METHODS OF SURGICAL REPAIR OF RUPTURED ACHILLES TENDONS

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Current methods of treatment for acute Achilles tendon ruptures vary in their levels of invasiveness, from open surgical repair to percutaneous suturing to equinus casting. Only one previous study has evaluated the results of the percutaneous surgical technique (Ma and Griffith, 1977). Our retrospective study was conducted to evaluate isokinetic plantar flexion (PF) symmetry following two methods of surgical treatment (primary open repair and percutaneous repair) of acute closed ruptures of the Achilles tendon. Twenty male patients (mean age=43.8 ± 9.4 yrs) who sustained sport-related Achilles ruptures participated in this study. All patients possessed a normal contralateral Achilles tendon for comparative purposes. Maximum voluntary torque values at 20° and 35° of plantar flexion were employed to evaluate postsurgical/contralateral normal limb symmetry. In an effort to isolate the contributions of the gastrocnemius and soleus to PF torque, the subjects' knees were positioned at 0° and 90° of flexion, and torques were measured at 60° and 120°/sec. Results of paired t-tests revealed significant differences ($p < 0.002$) between postsurgical and contralateral normal limbs for five of eight isokinetic parameters. Statistically significant PF postsurgical limb strength deficits (18 to 38%) were observed for each of four isokinetic parameters isolating the gastrocnemius, while only 1 of 4 parameters designed to isolate the soleus was significant, with postsurgical limb PF deficits ranging from 9 to 15%. Results of ANOVAs revealed no significant differences ($p > 0.01$) between the open repair group ($n = 10$) and the percutaneous repair group ($n = 10$) for any of the isokinetic parameters. In the patient population studied, the two Achilles tendon surgical repair techniques produced similar functional outcomes at an average of 22.4 ± 8.2 months after surgery. Despite an average of 13.6 ± 3.3 months of postoperative physical therapy, subjects demonstrated significant postsurgical limb isokinetic asymmetries, irrespective of surgical technique. The significant residual deficits in postsurgical limb isokinetic PF strength observed in our study suggest an incompleteness of rehabilitation or the physiologic inability to regain these characteristics postoperatively.

A MODEL FOR THE MEASUREMENT OF JOINT PROPRIOCEPTION CHARACTERISTICS

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Proprioception is described as the perception or awareness of joint positioning. We describe a model for measuring proprioception in the knee, and provide some normative data for both trained and untrained individuals when tested on the proprioception device. Clinicians have traditionally attempted to refine and enhance athletes' acuity to changes in joint position in order to produce dynamic stabilization in otherwise unstable joints. The mechanism responsible for proprioceptive sense was speculated to be various neural components located within and around joint capsules. Recent research, particularly in the area of ACL injury, has identified neural mechanisms contributing to joint proprioception, which are located within the ligaments themselves. Thus, any disruption to the integrity of a ligament seemingly compromises the proprioceptive acuity that the individual possesses. Until recently, clinicians have been unable to quantitatively assess the proprioceptive characteristics of joints, which has resulted in unproven clinical techniques being employed to enhance proprioceptive function. The proprioceptive testing device (PTD) designed for this study measured angular displacement occurring in the knee prior to the subject's detection of passive joint movement. The PTD consists of an instrumented goniometer, which is attached to a motor driven arm that passively extends the subject's knee at a pre-set controlled angular velocity. A rotational transducer interfaced with a digital microprocessor counter provided angular displacement values. Subjects were seated with a pneumatic compression boot positioned on each foot. The boot was attached to the motor driven arm that passively extended the knee from 60° of flexion. Subjects were tested at 0.5°/sec and 1.0°/sec for detection of changes in knee joint position. Results from preliminary studies on the PTD revealed that trained female intercollegiate athletes (n= 13) possessed significantly (p< 0.05) more precise acuity to changes in joint position than untrained college females (n= 17), with mean angular displacements of 0.9 degrees and 2.5 degrees respectively. These data indicate that the neural mechanisms responsible for skilled athletic movements may undergo adaptive changes as a result of training. If further research reveals that proprioceptive characteristics can be refined by training, significant implications exist relative to rehabilitation of athletes with ligament disruptions.

ELECTROMYOGRAPHIC RESPONSE OF PERONEAL MUSCLES IN SURGICAL AND NONSURGICAL INJURED ANKLES DURING SUDDEN INVERSION

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This study was done to assess the electromyographic (EMG) response of peroneal muscles during sudden unexpected ankle inversion, measured by time to muscle contraction (latency). Three groups participated in the study, people with: 1) lateral ankle sprains rehabilitated nonsurgically (n=7); 2) sprains rehabilitated following surgery (n=7); and 3) injury free ankles (n=11). Peroneal latency was assessed by dropping the subjects into inversion from a special platform. The platform was designed so that either ankle could be inverted to 35° without warning. Paired t-tests indicated no significant differences (p > .05) in latency between individual subjects' injured and uninjured ankles. ANOVA revealed no significant latency differences (p > .05) between the three groups. The study suggests that bilateral peroneal latency is unaffected by injury.

Although it has been thought that healthy muscles provide a defense against ankle sprain, their latency is not permanently affected by ankle injury, nor by surgery performed to correct defects from injury. It appears that mechanoreceptor impairment may be rehabilitated and is not a factor in ankle injury.

THE EFFECT OF A RECONDITIONING PROGRAM ON THE RECURRENCE OF BRACHIAL PLEXUS NEURAPRAXIA IN COLLEGE FOOTBALL PLAYERS

Cramer CR, Roschke MT, Palmieri JR: Barry University, Miami, FL 33161

Following the fall 1989 season, nine college football players who had eligibility remaining for the 1990 spring and fall seasons were placed on an exercise regimen to recondition their necks and shoulder girdles. This was done in an attempt to reduce the risk of re-injury to the brachial plexus and the resulting class I neurapraxia, which all subjects experienced during the fall 1989 season. At the conclusion of a ten-week reconditioning program, all subjects participated without restriction in all fifteen collision practices for the spring 1990 drills. At the conclusion of spring drills, it was observed that none of the nine subjects had exhibited any signs or symptoms of injury involving the brachial plexus. The subjects were allowed to proceed with the general neck and shoulder program used by the rest of the squad for the fourteen-week period between the end of spring drills and the start of the fall 1990 football season. One of the nine subjects did not participate in the fall 1990 season for non-medical reasons. The eight remaining subjects also participated in the team in-season neck and shoulder program during the fall 1990 season. Post-season evaluation of the eight remaining subjects revealed no recurrence of brachial plexus injury. This reconditioning program format, along with protective equipment considerations, may have a wide ranging effect on deterring the recurrence of brachial plexus neurapraxia in those football players who have had a previous episode.

METHODS OF APPLYING UNDERWATER ULTRASOUND: SCIENCE VERSUS FOLKLORE

Draper DO, Hatheway C, Fowler D: Illinois State University, Normal, IL 61761

Ultrasound is the treatment of choice when therapeutic deep tissue temperature rise (TTR) is indicated. Since ultrasound cannot be transmitted through the air, a conducting medium is necessary to transport the energy through the tissues. Two popular methods of applying ultrasound are through a topical gel, and by immersion in water. Most clinicians would agree that proper administration of underwater ultrasound includes movement of the sound head in a circular or stroking motion 1 to 2 cm from the skin surface. There appears to be a small group of clinicians who purport the idea that because ultrasound is easily transmitted through water (i.e., sonar and fish finders), the sound head does not need to be close to the treatment area. Proponents of this method simply drop the sound head in the water, adjust the intensity, and return in five minutes when the treatment is finished. To test whether this "lazy" technique has any scientific basis, a 23 gauge hypodermic needle microprobe was inserted 3 cm deep into the medial portion of the anesthetized gastrocnemius muscles of three subjects. The needle thermister then was connected to a monitor. Each subject's lower leg was immersed in a container of 35°C water. First the "passive" or "lazy" technique was applied. This consisted of pointing the immersed sound head toward the target and taping the applicator to the container. The intensity was then adjusted to 1.5 watts per cm², and the temperature

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was recorded every 30 seconds. Next, the traditional or "active" method of underwater ultrasound application was performed. During this treatment, the intensity settings and the method of temperature recording were unchanged from treatment one. The only difference was that the immersed applicator was moved in a circular motion at about 4 cm per second, 1 to 2 cm from the target area. The results showed that the active technique produced a TTR statistically greater ($p < .05$) than the passive technique. In fact, the passive technique caused a TTR in only one subject, and it was less than one-half degree Celsius. This investigation should clear up some misconceptions regarding passive underwater application of ultrasound, and dismiss ideas that are based upon folklore, not science.

AN EXAMINATION OF THE CONCENTRIC AND ECCENTRIC ISOKINETIC STRENGTH OF SHOULDER ROTATORS. **Reynolds RS, Hirschman LD: Morgantown Physical Therapy Associates, Morgantown, WV 26505**

This study was done in order to compare the concentric and eccentric isokinetic strength of shoulder rotators of 24 college baseball players (9 pitchers and 15 position players) with a group of ten normal 21 to 26 year olds (mean age=22.4 yrs), none of whom regularly participated in any dominant arm or over-the-head sport activity. Three maximal rotations of dominant shoulder rotators were tested at concentric speeds of 180°, 300°, and 450°/sec and eccentric speeds of 40°, 80°, and 120°/sec using a Biodex isokinetic system. Each subject was seated in an upright position, using the trunk and upper extremity stabilization straps, with the arm placed in 90° of shoulder abduction and the elbow in 90° of flexion. A comparison of the means showed no significant ($p < .05$) differences in the test groups for the variables of peak torque ratio, work/body weight %, maximum work repetition ratio, peak torque/body weight %, and maximum work repetition. However, trends that are clinically significantly important were noted. A concentric internal to external rotation ratio of 3:2 was found, while an eccentric internal to external ratio of 3:4 was found across all test groups at all test speeds. In addition, concentric work variables decreased with increasing speeds, while eccentric work variables remained constant as speeds increased. These findings have implications for the isokinetic testing and screening of shoulder rotators.

EFFECT OF GRAVITY CORRECTION ON SHOULDER EXTERNAL/INTERNAL ROTATOR RECIPROCAL MUSCLE GROUP RATIOS

Hellwig EV, Perrin DH, Tis LL, Shenk BS, University of Virginia, Charlottesville, VA 22903

Gravity correction is an accepted practice when determining the knee flexion/extension reciprocal muscle group ratios. This study examined the role of gravity correction in determining shoulder external/internal rotator reciprocal muscle group ratios. Thirty-three male subjects (mean age = 21.09 yrs, mean ht = 71.06 in, mean wt = 174.16 lbs) were assessed using the Kinetic Communicator (Kin-Com) for nondominant shoulder concentric and eccentric isokinetic average force of the internal and external rotator muscle groups. Testing occurred from the seated position at 150° per second through 85° of motion with the arm at 90° of abduction in the frontal plane. Concentric and eccentric reciprocal muscle group ratios were calculated from both gravity corrected (GC) and gravity uncorrected (GU) average force values by dividing external rotator values by internal rotator values. Paired t-tests indicated higher reciprocal muscle group ratios when corrected for the effect of gravity for both concentric (GU=.89, GC=1.05, $p < .01$) and eccentric (GU=.80,

GC=.90, $p < .01$) values than when not corrected. These findings indicate that gravity correction significantly influenced shoulder external/internal rotator reciprocal muscle group ratios when isokinetic assessment occurred from the seated position. Gravity correction in this test position detracted from the internal rotator values, and added to the external rotator values. As such, the gravity correction procedure is recommended when assessing shoulder rotation average force and reciprocal muscle group ratios from a seated test position.

EVALUATIVE TESTING OF FUNCTIONAL KNEE BRACES IN ANTERIOR CRUCIATE LIGAMENT DEFICIENT LIMBS: AN IN VIVO STUDY

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Four functional knee braces [Bledsoe (B), CTi, Don-Joy (DJ) and Lenox-Hill (LH)] were evaluated prior to and following six weeks of controlled physical therapy (PT) using an arthrometer (KT-1000), concentric/isokinetic testing (Biodex), functional testing, and symptom related discomfort/giving-way measures (Cincinnati-Knee Rating System) against a control (C) and a placebo [(P) Proslieve] condition, in order to determine knee performance effects on individuals with a unilaterally deficient anterior cruciate ligament (ACL). Six previously untreated male volunteers (age=33.7 ± 4.2 yrs, ht=172.7 ± 7.3 cm, wt=80 ± 6 kg) participated in the repeated measures study. Data were analyzed by factorial MANOVA for main effects followed by separate univariate ANOVA and tukey post hoc tests ($p < .05$). Arthrometer results indicated lower anterior tibial displacement (ATD) for the B brace at 67 & 89 Newtons (N). Reduced ATD was further noted for the B brace at 134 N when compared with the CTi and LH braces. ATDs for P, C and DJ brace conditions were not lower nor comparatively different from each other. Manual maximum displacement test(s) (MMDT) on the KT-1000 indicated a higher ATD for the P and the C conditions. No differences were found between braces during the MMDT. Greater ATD was demonstrated prior to PT for all testing conditions. Subjects' capacities to produce total concentric work (TCW) were found to be higher for the C than the braced or P. TCW for P and the LH brace conditions was also greater when compared with the CTi, B, and DJ braces. Peak torque, torque/body weight ratio, work/body weight ratio, maximum repetition work, and average power increased for all testing conditions following PT. No differences were noted between braced, C, or P trials for functional testing procedures or symptom-related discomfort/giving way. Functional performance values and subjective ratings for pain, swelling, partial giving way, and full giving way in the involved limb did improve significantly following PT for all testing conditions. No brace was determined comparatively better or worse than another in providing functional support or comfort. Overall, results indicated significant advantages in a controlled PT program for ACL deficient knees, when compared with functional bracing under C and P conditions.

This work was supported in part by Sentara Leigh Hospital, Norfolk, VA and by the Mid-Atlantic Athletic Trainers' Association.

PREINJURY AND POSTINJURY PERFORMANCE OF DIVISION I FOOTBALL PLAYERS AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Moffatt KA, Heiser TH, Clare PE, Sullivan GF, Weber JE, McCarthy JA: Drs. Gross, et al., PC, Omaha, NE 68124

The competitive football athlete with an anterior cruciate ligament

(ACL) deficient knee desires not a knee that will allow him to return to activities of daily living, but one that will allow him to return to a full level of competition. In this paper we report the results of ACL reconstructions of NCAA Division I football players, and we try to present tests that will enable the athletic trainer and surgeon to quantify the athlete's return to a competitive level. During 1984 through 1988, 17 intraarticular ACL reconstructions were performed on football players at a single university. Preinjury and postinjury values were obtained in the 10 yd dash, 40 yd dash, 15 yd agility run, 300 yd shuttle run, and the vertical leap. Preinjury and postinjury isokinetic quadriceps and hamstrings strength was tested at 60°/sec using the Cybex II dynamometer. Fourteen (82.4%) of the 17 subjects who participated in the study returned to competition. Six of the 17 were not retested with regard to their functional abilities. Three were unable to meet the demands of the sport after undergoing surgery and withdrew from the football program. The remaining three participants were able to return to the sport. Eligibility, however, for two of the three players expired, and the last participant tore his contralateral ACL before he was able to be retested. The 11 subjects who returned to competition and were retested had achieved their preinjury level of strength as measured by the Cybex II. The results of the functional tests showed very little intrasubject variance (SEM 0.2 to 1.8%). Consequently, a mean functional recovery value was obtained on each patient. Seven (63.6%) returned to 95% of their preinjury status while the remaining 10 athletes (90.9%) returned to at least 90% of their preinjury status. In conclusion, this study demonstrates that the collegiate football player may be able to return to competition following ACL reconstruction. However, functional status may decline 5 to 10%, which may present significant problems at their elite level of competition.

SHORT ARC CYCLE ERGOMETRY TO EXPEDITE POST OPERATIVE KNEE REHABILITATION

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Many patients have great difficulty in regaining knee motion and strength after knee surgery. Continuous passive motion machines have been used to regain motion; however, they allow atrophy and cannot facilitate full flexion. This process has been expedited utilizing cycle ergometry. The disadvantage of the conventional cycle ergometer (170 mm crank length) is that it cannot be used before a patient has approximately 100° of knee motion. The short crank cycle ergometer can now allow rehabilitation in most patients with much less motion, making it accessible early in the postoperative course. A computer program, with the addition of a patient's lower leg measurements, can generate an individualized range of motion profile. This device could then be set specifically for the requirements of that patient. Tracings from the quadriceps and hamstrings of 15 individuals were taken with surface electrodes of a TECA TE4 Electromyographic Recorder while the subjects were on a CPM machine and a cycle ergometer. The study groups consisted of five normal individuals and 10 anterior cruciate reconstruction patients. Both groups showed no evidence of myoelectric activity at any point on the CPM machine. The CPM machine may have generated motion, but gave no active stimulus to muscle maintenance or strengthening. EMG patterns of the quadriceps and hamstrings were then studied while individuals were using the cycle ergometer. The responses of the normal individuals and the anterior cruciate patients were similar. The cycle ergometer produced a system that generated a natural neurogenic stimulus to muscle contraction and promoted active exercise. Muscle maintenance and

strengthening were parts of the process along with the generation of motion. Continued clinical results have been excellent, with patients showing significant gains in both motion and strength.

STATIC AND ISOKINETIC TREATMENTS OF CHONDROMALACIA PATELLA: A COMPARATIVE INVESTIGATION

Roncarati A, McMullen W, Koval P: University of Massachusetts, Boston, MA 02125-3393

Literature on the comparative effectiveness of nonoperative treatments for patellofemoral pathologies has been limited. During this investigation we studied the effectiveness of selected static and isokinetic physical therapy rehabilitation programs for subjects with a clinical diagnosis of chondromalacia patella. Criteria employed to assess the effects of these therapeutic programs included measures of knee functional capacity using the Cincinnati Rating System, and traditional measures of leg strength and flexibility. Twenty-nine subjects were screened by an orthopedic physician and assigned to a control (n = 9), static (n = 11), or isokinetic (n = 9) exercise group. Noncontrol subjects were administered a program of 12 treatments, three times a week, for four weeks by a registered physical therapist. Results of the ANOVA for 17 pretest and posttest measures indicated that the static and isokinetic groups demonstrated significant ($p < 0.05$) functional improvements over the control group in walking, stair activity, running, jumping/twisting, and overall activity level, as well as increased quadriceps strength and hamstring range of motion. No significant differences, however, were determined to exist between the static and isokinetic groups. The major implication of this investigation is that static and isokinetic treatment programs provide positive and comparable rehabilitation effects on the functional capacity of the knee joint for subjects with chondromalacia patella. Static therapy, however, appears to be the most cost-effective.

EFFECT OF TWO TYPES OF ORTHOSES ON BALANCE FOLLOWING ACL RECONSTRUCTION

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This investigation was designed to assess the effect of two types of orthoses on balance following autograftic anterior cruciate ligament reconstruction. It was hypothesized that an increased time on balance would be the result of these intervening orthoses. This study consisted of 7 males and 1 female with an equal number of right and left ACL reconstructions ranging from 4 to 24 months postoperative. A Lafayette stableometer was used to determine time on balance. The subjects were given five, 20-second trials for learning. Three different bouts were performed with five, 20-second trials in each bout. The bouts consisted of determining time on balance with no orthosis, with a neoprene sleeve, and with a functional ACL brace on the involved knee. Statistical analysis using an ANOVA showed a significant difference ($p = .05$) between the control and neoprene sleeve, and control and ACL brace; but no statistical difference between the neoprene sleeve and ACL brace. It may be postulated that both the neoprene sleeve and ACL brace heightened mechanoreceptor response around the knee joint, thus increasing time on balance. It is documented that ACL braces contribute little to deterring anterior excursion of the tibia on the femur at physiological loading, but it has been hypothesized that they serve more of a proprioceptive function. The ability to balance can be considered, in part, a proprioceptive function, and damage to lower extremity joint proprioceptors would affect balance time. Muscle strength and en-



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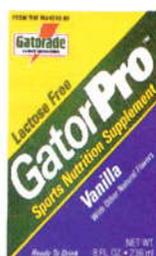
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duration have an important role in a multiple dynamic test of this type and were not considered in this study. Additional research should address the areas of muscle strength, length of time from surgery, and the effects of various types of functional braces.

THE EFFECTIVENESS OF A SEMIRIGID ORTHOSIS AS A PROPHYLAXIS FOR ANKLE INJURIES: A RETROSPECTIVE STUDY

Lepp TM, Teal SW: Linfield College, McMinnville, OR 97128

This study was done in order to analyze the effectiveness of a semirigid orthosis in the prevention of ankle injuries in actual sport situations. Eighty basketball athletes (59 males and 21 females) who were at Linfield College during the fall of 1988 through the spring of 1990 served as subjects for this study. Thirty-seven subjects (34 males, 3 females) chose to wear an Aircast Sport-Stirrup while 43 (25 males, 18 females) did not; these 43 subjects formed the control group. The 80 subjects in this study participated in 153 competitions and 500 practice sessions; 24 ankle injuries were incurred by subjects during the two-year study. Chi square analysis indicated a significant difference in the number of injuries to the subjects who wore the semirigid orthosis and those who did not ($p=.05$). The average amount of time lost from activities because of an ankle injury was less for the Sport-Stirrup group than for the control group. The use of the Sport-Stirrup appeared to decrease the incidence and severity of ankle injuries, and served as a relatively effective prophylactic device for ankle injuries during basketball practices and competitions.

EVALUATION OF DYNAMIC STABILITY PROVIDED BY ANKLE PROPHYLACTIC DEVICES BEFORE AND AFTER EXERCISE

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Ankle injuries continue to be a frequent and debilitating problem in sport. Several recent clinical studies have revealed that ankle stabilization methods, other than prophylactic ankle taping, are equally or more effective than taping in injury prevention. During this study, we compared the dynamic stability provided by three modes of ankle prophylaxis (closed basketweave adhesive taping, lace-up brace, and semirigid orthosis) with a control condition (no support) in limiting ankle inversion during repetitive walking (4 mph) and running (9 mph) on a 10° laterally-tilted treadmill. The treadmill was configured to simulate conditions encountered while running on a typical city street. Ten subjects (age=23.4 ± 2.3 yrs) participated in four separate, randomly-assigned testing sessions during which they were videotaped during treadmill walking and running before and after 20 minutes of vigorous exercise. The maximum inversion angle during each trial (footfall) was determined via two-dimensional analysis of videotape using Peak Performance software. During data reduction, an eight-trial average maximum inversion angle (AMIA) was calculated for each subject in each experimental condition. Two-way repeated measures ANOVAs revealed significant differences ($p<0.025$) in AMIA between the ankle devices at 4 and 9 mph, and between pre-exercise and post-exercise inversion measurements at 4 mph. Scheffé post hoc analyses indicated significant differences ($p<0.025$) in AMIA between the control condition and the semirigid orthosis (4 and 9 mph), and the lace-up brace (4 mph). At both 4 and 9 mph, the semirigid orthosis provided the most inversion restraint, followed by the lace-up brace, the

closed basketweave taping, and the control condition. Prophylactic taping provided the least amount of pre-exercise and post-exercise inversion constraint, as measured by AMIA. We concluded that the semirigid orthosis and lace-up brace that were evaluated were more effective in limiting dynamic ankle inversion than prophylactic ankle taping, both before and after exercise.

This study was supported by Aircast, Inc. and Swede-O-Universal.

COMPARISON OF RECOVERY RATES ASSOCIATED WITH DIFFERENT MODES OF CONTINUOUS COMPRESSION THERAPY FOLLOWING INVERSION ANKLE SPRAIN **Wilkerson GB, Horn-Kingery HM: Trover Clinic, Madsonville, KY and United States Air Force Academy, Colorado Springs, CO**

During this continuing study, the rates of ankle function recovery among military cadets who sustained a Grade II inversion ankle sprain were compared. In the preliminary phase of this study, 12 subjects were treated with an Aircast Air-Stirrup brace (group I) and 22 subjects were treated with a modified Air-Stirrup brace that was worn over a U-shaped/gel-filled device (Aircast Cryo/Strap) that selectively compressed the soft tissues around the periphery of the fibular malleolus. All subjects received cryotherapy treatments immediately following injury and during the early stages of recovery. Twelve subjects received a Cryo/Strap that was room temperature at the time of application (group II) and 10 subjects received a Cryo/Strap that was frozen at the time of application (group III). Criteria for classification of strain severity included weightbearing capability, tenderness elicited by palpation, response to manual inversion stress, degree of instability, edema accumulation, and suspected pathology. Functional capability was quantified throughout recovery by means of a 0 to 100 point function scale. Regression analysis of the data indicated a very strong linear relationship between function scores and days post-injury for every subject ($r=.81$ to $.99$, avg $r=.95$). A two-way ANOVA procedure was used to analyze data for the three treatment groups at nine levels of function. The dependent variable was the number of days required to attain a given level of function. A statistically significant difference between treatments was found ($p<.10$). Pairwise comparisons of the group means demonstrated significant differences between group I and group II and between group I and group III ($p<.05$). Group II and group III did not differ significantly from each other. These findings suggest that the U-shaped Cryo/Strap device enhances the rate of restoration of functional capabilities following a Grade II inversion ankle sprain. Further, the rate of recovery does not appear to be affected by the temperature of the device at the time of application.

LOWER EXTREMITY STRESS FRACTURES: WHO IS AT RISK?

Dolk WD, Draper DO: McLean County Orthopedics/Sports-medicine Center, Bloomington, IL 61704

Stress fractures were first identified during World War I when military recruits complained of lower extremity pain following marching drills. Today, stress fractures continue to be a nemesis that afflicts many athletes. With the increased technology during the last decade, diagnosis of stress fractures has become easier. This study was conducted to identify populations (by age, sport, and sex) who are most at risk to develop stress fractures. Data of 54 patients who had been diagnosed with bone-scan positive stress fractures, and who had been seen over a one-year period, were examined. A comparison of age, sex, sport, and fracture site was made. Athletes in the 12 to 19 years age group had a higher incidence ($p<.05$) of

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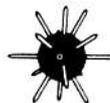
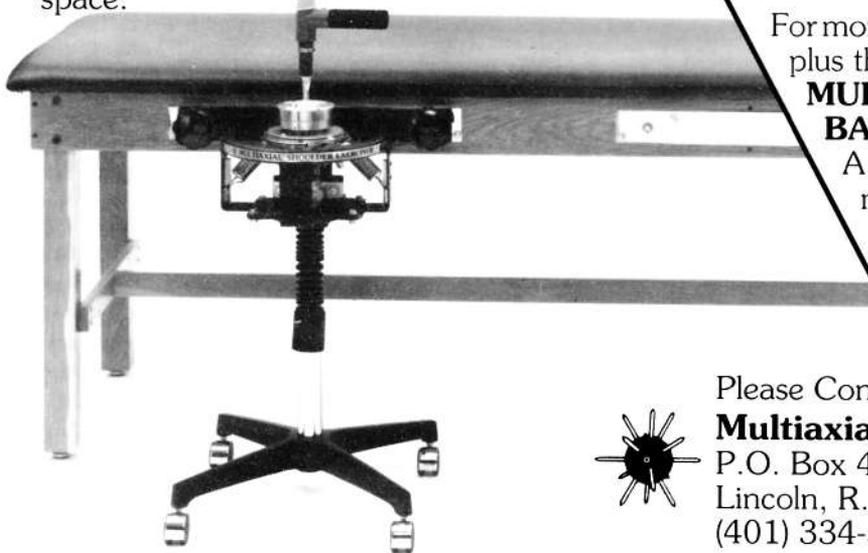
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stress fractures than those athletes older than 19. The most common fracture site for teenagers was the tibia, while the foot was affected more in the group older than 19. Stress fractures of the foot were most often seen in athletes who were involved in stop and go activities, such as basketball, volleyball, football, and gymnastics. Runners suffered the most stress fractures of the tibia. Recreational and competitive runners suffered more stress fractures (61%) than all other sports/groups combined. Seventy-six percent of stress fracture patients seen during the one-year period were females. These results indicate that runners are more susceptible to stress fractures than any other athletes studied. The results also indicate the need for better training and protection measures targeted to secondary school athletes and to females.

THE EFFECTS OF TRAUMA IN THERAPIES ON SKELETAL MUSCLE

Fisher BD, Knight KL: Physical Education and Sport Studies, University of Alberta, Edmonton, Alberta, Canada T5A 1R9

The focus of this research was the investigation of the effects of acute blunt trauma, drugs, and therapeutic modalities on the ultrastructure and protein content of skeletal muscle. A simple device for producing a humane and reproducible experimental model of blunt trauma to rat skeletal muscle was used. Ultrastructural events in the traumatized muscle were observed over 30 days. From 0 to 2 days after trauma, there was a marked loss of the muscle, associated with an acute inflammatory response. From 3 to 14 days, the muscle underwent regeneration with a rapid proliferation of sarcolemmal nuclei, activation of satellite cells, and restoration of sarcomeres. Muscle regeneration was complete 21 days following trauma. By three days post-trauma, muscle protein decreased (40 to 58%) compared to the protein in muscles of control rats ($p > 0.05$). The protein content of the uninjured contralateral muscles decreased an average of 23% when compared to muscle protein of uninjured controls ($p > 0.05$). Twenty-one days were required for the protein contents of the injured muscles to return to those of the normal control muscles. The administration of naproxen, a nonsteroidal anti-inflammatory drug (NSAID), partially prevented the decrease in protein contents of the traumatized muscles. The positive effect of naproxen appeared to be related to a prostaglandin-dependent mechanism. The effect of ultrasound therapy on the protein content of muscles that were traumatized or in the vicinity of trauma, varied with muscle type. There was no significant difference in protein content between the traumatized medial gastrocnemius muscle that was treated with ultrasound between days 3 and 9 after injury, and the untreated trauma control. Ultrasound therapy decreased the production of the prostaglandin PGE_2 in the traumatized muscles, when compared to its production in the corresponding trauma-control muscles.

SEXUALLY TRANSMITTED DISEASE EDUCATION AND CLINICAL PRACTICES IN NATA UNDERGRADUATE PROGRAMS

Scotch D, Sittler M, Kimura I: Temple University, Philadelphia, PA 19122

Sexually transmitted diseases (STDs) have existed for thousands of years; however, there has been renewed interest in recent years, particularly since the initial diagnosis of the deadly acquired immune deficiency syndrome (AIDS) in 1981. We investigated whether STD

education is provided in NATA-approved undergraduate athletic training programs, and determined the practices employed in their clinical settings to reduce the risk of STD infection. A questionnaire was developed and mailed to the directors of the 68 undergraduate programs approved by the NATA as of Fall, 1989. All 68 questionnaires were returned and analyzed. The results indicate that STD education is being provided in 85% of the programs; 66% do so in the classroom setting. More than two hours of classroom instruction on STD-related subject matter occurred in only 21% of the programs. The results also indicated that standard procedures, verbal or written, exist in 90% of the programs' clinical settings; however, the efficacy of many practices to reduce the risk of STD infection is questioned. The following procedures, recommended by the Centers for Disease Control, appear not to be universally followed: the use of latex gloves when treating bleeding athletes; the use of a 10 percent bleach cleaning solution; and the disposal of needles in a hazardous waste container. In conclusion, while STD education is included in the majority of the programs, not all of the clinical practices are stringent enough to reduce the risk of STD infection.

POSTER PRESENTATIONS

EFFECT OF POWERHEAD POSITION ON ELECTRICAL ACTIVITY IN THE VASTUS MEDIALIS OBLIQUE AND VASTUS LATERALIS DURING ISOKINETIC KNEE EXTENSION

Tracy JE, Briggs K, Indico S: East Carolina University, Greenville, NC 27858

Using electromyography (EMG), this study measured the intrinsic electrical activity of the right vastus medialis oblique (VMO) and vastus lateralis (VL) muscles during isokinetic knee extension at three different powerhead positions. Averaged root mean square (RMS) EMG values of the VMO and VL were obtained from twenty healthy subjects, ages 20 to 25 years (10 male, 10 female), during maximal isokinetic knee extension at velocities 30°, 60°, and 90°/sec on the KIN-COM robotic dynamometer. Values were recorded as each subject extended his or her knee with the powerhead positioned: a) at neutral, b) in a 15° downward tilt, and c) in a 15° upward tilt at each velocity. Electrical activity was recorded using silver/silver chloride surface electrodes positioned over the muscle bellies of the VMO and VL, and was converted to digital values via the KC/EMG interfaced directly with the KIN-COM dynamometer computer. Analysis of the data using a split-plot factorial design with a significance level of $p < .05$ showed: a) significantly more activity in the VL, b) significant differences in electrical activity between the three velocities, with activity increasing linearly as velocity increased, and c) significant differences in electrical activity between the three powerhead positions with the greatest electrical activity occurring in the neutral position followed by upward tilt and downward tilt positions. The results of this study showed that electrical activity in the VMO and VL is greatest with the isokinetic dynamometer positioned in neutral at all speeds tested, and that it increases as velocity increases. This information is of benefit to athletic trainers who are interested in attaining maximal motor activity in either the VMO or VL during isokinetic rehabilitation of the knee.

SPORTS MEDICINE NEEDS OF THE PUBLIC SECONDARY SCHOOLS IN THE SOUTHEASTERN REGION OF THE UNITED STATES

Wright KE, Whitehill WR: The University of Alabama, Tuscaloosa, AL 35487-0312

This study determined the sports medicine needs of the public secondary schools in the southeastern region of the United States. A needs assessment of the current state of medical coverage available to the interscholastic athlete in the southeastern United States was undertaken. Four broad areas were addressed: 1) professional preparation for athletic trainers; 2) the combination of credentials that is most marketable in the public secondary school; 3) current medical coverage for the high school athlete; and 4) insurance/liability aspects of athletic participation. A review of the literature confirmed that previous studies also had identified similar areas of concern. A 25 item questionnaire was distributed to 925 public school superintendents. From this group, 640 completed and returned the instrument for a 69.1 percent return rate. The superintendents indicate that there is a need for athletic trainers at the secondary school level (89.1%). Litigation connected with athletic injury is a real concern for the respondents (76.2%). Additionally, 77.6% feel that the employment of an athletic trainer would reduce this litigation possibility. In response to the eight alternatives offered for the employment of an athletic trainer, the superintendents indicated that the best option is the teacher/athletic trainer combination (42.4%). The academic areas of certification strongly favored by 57.3% are the health/physical education, math, and science fields. There was an even split between bachelor and master degree level requirements, and the respondents would like a person with between one and three years of experience. Unfortunately, according to the respondents, only 15.4% of their athletes are receiving services from an athletic trainer. In addition, medical records are systematically collected only 66.2% of the time in competition and 63.5% of the time at practice. In each community, the medical profession, educational system, and local leaders need to examine the total health care system available to the secondary school athletic program. Medical issues need to be addressed, athletic programs evaluated, and an allocation of funds committed.

RISK FACTORS PREDISPOSING NON-CONTACT ANTERIOR CRUCIATE LIGAMENT TEARS IN HIGH SCHOOL AND COLLEGE FOOTBALL PLAYERS

Woodford R, Beckett M, Breisinger T, Denegar CR, Proctor EM: School of Physical Therapy, Slippery Rock University, Slippery Rock, PA 16057

Despite the extensive research addressing anterior cruciate ligament (ACL) injuries, risk factors predisposing injury have not been reported. This study was performed to investigate six potential risk factors. Measurements of calcaneal eversion in prone (CEP) and in stance (CES), tibial varum (TV), navicular drop (ND), and anterior displacement of the tibia on the femur via passive drawer (PD), and manual maximal drawer (MM) (using a KT-1000 knee arthrometer) were investigated for their usefulness in predicting ACL tears in high school and college football players. Fourteen players with ACL tears and fourteen players without previous ACL injury were matched by position, height, weight, and age in an effort to minimize differences in exposure to injury. Discriminant analysis with stepwise data entry resulted in three predictor variables (ND, PD, MM) being retained in the analysis. The canonical correlation between group membership and D scores was .46 ($p=.11$). However, using the regression equation to predict classification of subjects, 71.43% of the cases were correctly predicted ($\chi^2=7.43, p<.01$). These

results suggest that high school and college football players may be at risk for non-contact ACL injuries if measurements of ND, PD, and MM are high. Currently, additional data are being collected to enhance our understanding of ND, PD, and MM as risk factors and to explore additional potential risk factors.

A COMPARISON OF PATIENT SATISFACTION REGARDING THE LENOX HILL AND CTi FUNCTIONAL KNEE BRACES

Kauth WA, Draper DO, Liverman RD, Kauth WO: Department of Physical Education and Athletics, Taylor University, Upland, IN 46989

Functional knee braces are recommended for use by many athletic trainers for the purpose of protecting individuals who have suffered anterior cruciate ligament injury. Often the athlete is not aware of the various braces available, and he or she simply agrees to wear what is recommended by the athletic trainer or clinician. Two popular functional knee braces currently employed by clinicians are the Lennox Hill and the CTi. Manufacturers of these braces have extensive advertising campaigns aimed at convincing athletic trainers to use their product. What has been overlooked, is an evaluation of what patients like and dislike about each brace. This study was done to investigate patient perceptions of the Lennox Hill and the CTi functional knee braces. Two-hundred former patients of the Sports Medicine and Physical Therapy Center of Bloomington, Illinois, served as subjects. Names of all patients who had been prescribed either of the two braces during the past five years were entered into a computer. The computer then generated a random list of 100 Lennox Hill and 100 CTi brace wearers. Subjects ranged in age from 15 to 35 years old, with a male to female ratio of three to one. A survey aimed at measuring stability, comfort, durability, and overall satisfaction was mailed to the subjects. The return rate was 44% (88). An analysis of the data revealed a significant difference ($p<.05$) in patients' perceptions regarding stability, comfort, durability, and overall satisfaction of the two braces, with the CTi brace being judged superior in all areas surveyed. It was also established that males and females were equally satisfied with their knee brace, whether it was the Lennox Hill or the CTi. This study did not uncover any scientific proof that one brace was superior to the other. However, this investigation did show that the majority of CTi functional knee brace wearers were more pleased with their brace, than were the subjects who wore the Lennox Hill brace. The investigators recommend that patient surveys be continued for the purpose of improving existing, or creating new functional braces.

THE RELATION OF ANTHROPOMETRIC MEASURES TO ELBOW FLEXION AND EXTENSION ISOKINETIC STRENGTH MEASURES

Synowka DP, Goss FL, Robertson RJ, Metz KF, Ray RL, LeMahieu P: Sport Management Department, Robert Morris College, Coraopolis, PA 15108

Previous isokinetic investigations have examined the relation of anthropometric measures to peak torque (PT), but not to torque acceleration energy (TAE) or total work (TW). An investigation was performed to examine the relationship between the selected anthropometric measures of arm girth (AG), elbow width (EW), abdominal girth (ABG), lower arm length (LAL), height (H), body weight (BW), and lean body weight (LBW) as determined by hydrostatic weighing, and the sum of three skin-fold sites (SKFLD) to elbow flexion (EF) and elbow extension (EE). PT, TAE, and TW were performed at slow (60°/sec) and fast (240°/sec) speeds of contrac-

tion. Eighty-five nonathlete young adult males (mean age=20.36 ± 2.36 yrs) served as subjects. Significant zero order correlation coefficients ($p \leq 0.1$) were determined for: 1) EE PT with r 's ranging from 0.30 to 0.60 for BW, AG, LBW, ABG, and EW; 2) EE TAE with r 's ranging from 0.31 to 0.42 for LBW, AG, and EW; 3) EE TW with r 's ranging from 0.32 to 0.59 for BW, LBW, ABG, AG, and EW; 4) EE PT with r 's ranging from 0.35 to 0.41 for LBW and AG; 5) EFTAE had one of 0.30 for LBW; and 6) EFTW with r 's ranging from 0.28 to 0.34 for LBW and AG. In conclusion, these anthropometric measures did not highly correlate with EE and EF PT, TAE, and TW. Therefore, the usefulness of these measures in the development of isokinetic normative standards for elbow flexion and extension is questionable.

INCLINOMETER MEASUREMENT OF KNEE RANGE OF MOTION: RELIABILITY AND CORRELATION WITH A GONIOMETER

O'Connor DP, Russell JA: Joe W. King Orthopedic Institute, Houston, TX 77030

This study was done in order to estimate intratester and intertester reliability of inclinometric knee measures and to determine if there is a relationship between inclinometry (INC) and goniometry (GON) of knee range of motion (ROM). Twenty-nine healthy students of average college age volunteered to participate. None of the subjects had sustained knee injury within the previous year, nor had they ever undergone knee surgery. Three testers with no INC experience were trained in the use of the Ortho Ranger II inclinometer. Following warm-up, each subject's total right knee ROM was measured by INC. All three testers completed three trials on each subject during a single session. One of the testers with previous GON experience then measured each subject's total right knee ROM with a standard 12" goniometer. Repeated measures ANOVA was performed among trials, among testers, and between devices for INC and among trials for GON. Both devices showed excellent intratester reliability estimates, with INC being slightly better than GON (.997 and .988, respectively). Intertester reliability for INC was estimated at .969. INC also had a lower standard error of measurement (SEM) in the hands of a single tester than did GON (0.58 vs. 0.87 degrees). The Pearson product moment correlation coefficient for the two devices was somewhat high ($r=.82$), but INC and GON measurements were found to be significantly different ($p < .008$). These results suggest that INC is more reliable than GON for measuring total knee ROM, but that the two methods seem to produce different ROM measurements on the same knee. The advantages of INC may be outweighed by factors such as the cost of the instrument and the difficulty in assessing knee flexion and extension limits, as described by the International Standard Documentation Method.

THE XISCAN 1000 FLUOROSCOPE: APPLICATION, RELIABILITY, AND COST EFFECTIVENESS IN A SPORTS MEDICINE SETTING

Gocke TV, Allyne K, Street SA, Yates CS, Curl WW, Martin, DF: Wake Forest Sports Medicine Unit, The Bowman Gray School of Medicine, Winston-Salem, NC 27109-7329

This study was performed to evaluate the utility, reliability, portability, and cost effectiveness of the Xiscan in a sports medicine environment. The Xiscan is a low powered radiographic and fluoroscopic imaging system that produces a radiation exposure of less than 0.1 mv/hr to both the operator and the patient. This level is safer than the National Radiologic standards for safety in medical usage. During the study period (February 1989 through December

1990), the Xiscan was used to perform 331 musculoskeletal exams on 240 athletes. Twenty-six fractures were diagnosed by the team physicians. Positive diagnoses were followed with conventional radiographs, and the positive readings were confirmed in each case. There were no reported cases of a negative fluoroscopic diagnosis being reversed after radiographic examinations. The most commonly imaged area was the wrist/hand/finger (180) followed by the ankle (56), foot/toes (40), elbow/forearm (18), knee (12), shoulder (8), and low leg (4). The initial cost of the Xiscan was \$18,000. If 60% of the athletes examined were evaluated using conventional radiographs, the estimated cost would have been \$37,000. The savings, from decreased medical expenses and a possible decrease in insurance premiums, would more than cover the cost of the Xiscan. However, the most important advantage is the decreased amount of time that the athlete must spend away from classes. Trips to the physician's office would be reduced, and less time would be spent waiting for x-rays to be taken. In conclusion, the Xiscan 1000 is safe, the results are reliable, a significant financial savings to the department is indicated, and the amount of time that the athlete must spend away from class while seeking medical care is reduced.

COMPARISON OF THREE METHODS OF ASSESSING STRENGTH IMBALANCES AT THE KNEE

Moss CL, Wright PT: Bowling Green State University, Bowling Green, OH 43403

Three strength measurement methods for determining muscle imbalances at the knee were compared in 41 (23 female, 18 male) track and field NCAA Division I athletes. Peak quadriceps (Q) extensions and hamstring (H) flexions were measured isotonicity (IT), isometrically (IM), and isokinetically (IK). IK measurement was performed on a Cybex II at 60 °/sec. IM extension and flexion were performed using the Nicholas Manual Muscle Tester (Lafayette Instruments). IT measurements were done on a Nautilus (IT₁) and a Universal (IT₂) apparatus. Testing order was randomized to avoid a treatment order effect. A one-way independent ANOVA indicated that bilateral imbalance ratios were significantly lower ($p < 0.05$) when measured by IT₂ than when measured IT, IM, or IK. However, Q/H ratios were significantly greater ($p < 0.05$) when measured IK than when measured by the other methods. These results indicate that IT, IM, and IK strength measurement methods may be used interchangeably when determining bilateral strength imbalance ratios at the knee, but they should not be used interchangeably when assessing Q/H ratios. Determinations of excess imbalance ratios (>10%) showed no consistent pattern across methods, and this may indicate problems associated with attempts to identify safety limits from muscle testing.

MAGNETIC RESONANCE IMAGING OF KNEE INJURIES

Sterling JC, Meyers MC, Calvo RD: Fort Bend Orthopaedic & Sports Medicine Associates, Sugar Land, TX 77478

Traumatic sport injuries of the knee remain a diagnostic dilemma for the team physician and athletic trainer. The expedience of an accurate diagnosis is of utmost importance to the athlete, trainer, coach, parents, and team physician in regard to treatment, outcome and return to play. Magnetic resonance imaging (MRI) has come to the forefront in diagnosing internal derangement injuries of the knee. Previous studies indicate that the MRI, along with clinical history and physical examination, is an accurate and noninvasive adjunctive modality in the diagnosis of knee pathology. This study was done to determine the correlation between arthroscopic and MRI findings of actual knee meniscal and/or cruciate ligament injuries. A retro-

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spective/prospective study evaluated 112 MRIs of 50 nonarthroscopically treated knees and 62 arthroscopied knees. All surgeries were performed by the same surgeon. Using arthroscopy as the "gold" standard, the overall accuracy of the MRI in the diagnosis of knee pathology was 89.9%. The overall sensitivity, specificity, negative predictive value (NPV), and positive predictive value (PPV) were 85.9%, 91.1%, 95.6%, and 74.2%, respectively. The incidences of specific pathology in 62 knee injuries were 53.2% medial meniscus, 17.7% lateral meniscus, 14.5% anterior cruciate ligament, and 6.5% posterior cruciate ligament. In the normal algorithm for diagnosis and treatment of sports injuries of the knee, the MRI adds a highly accurate and noninvasive modality for the documentation of meniscus/cruciate ligament tears.

RELATIONSHIP BETWEEN ISOKINETIC AVERAGE FORCE, PEAK FORCE, AVERAGE TORQUE, AND PEAK TORQUE OF THE SHOULDER INTERNAL AND EXTERNAL ROTATOR MUSCLE GROUPS

Tis LL, Perrin DH, Hellwig EV, Shenk BS: University of Virginia, Charlottesville, VA 22903

Microcomputer interfacing with isokinetic dynamometers has enabled the rapid quantification of force and torque. The Kinetic Communicator (Chattecx Chattanooga, TN) permits measurement of average force (AF), peak force (PF), average torque (AT), or peak torque (PT) as the reference value. This study examined the relationship between concentric and eccentric AF, PF, AT, and PT of the internal and external rotator muscle groups of the shoulder in 33 males (mean age = 21.09 yrs; mean ht = 71.06 in; mean wt = 174.16 lbs). Testing of the non-dominant side was performed from a seated position at 150°/sec through 85° range of motion with the arm at 90° abduction in the frontal plane. Peak values for both force and torque were obtained from the highest point in the respective strength curves, whereas average values were obtained across the entire curve. As such, peak force and torque values were consistently greater than average force and torque values, respectively. Correlation matrices showed a relationship between AF, PF, AT, and PT ranging from $r=.86$ to $.97$ for concentric external rotation, $r=.94$ to $.99$ for eccentric external rotation, $r=.86$ to $.96$ for concentric internal rotation, and $r=.55$ to $.97$ for eccentric internal rotation. The strong relationship between AF, PF, AT, and PT in this investigation suggests that any of these values may be used for isokinetic assessment. Average values of either force or torque are obtained throughout the complete range of motion tested. As such, it is imperative to standardize the range of motion tested between and among subjects for accurate interpretation of either average force or average torque.

RIGID VERSUS SOFT FOOT ORTHOSES FOR A RUNNER WITH STRESS FRACTURES

McPoil TG, Cornwall MW, Nesbitt ME: Departments of Athletics and Physical Therapy, Northern Arizona University, Flagstaff, AZ 86011

This study was performed to determine the effect of rigid versus soft foot orthoses on forefoot and rearfoot force-time integrals (FTI) in a 20-year-old female runner with a history of tibial and metatarsal stress fractures. The subject had no history of foot or lower extremity pain for three months prior to data collection. A single-subject alternating treatments design (ABACA) was used to evaluate FTI for the following three conditions: 1) shoe-only; 2) shoe with rigid, balanced orthoses; and 3) shoe with soft, accommodative orthoses. The subject wore a new pair of running shoes 120 hours prior to data collection. The rigid orthoses had been previously made for her and

were less than one year old. The soft orthoses were made and worn for 40 hours prior to data collection. Force data were collected 12 times for each condition while the subject walked at 2.5 mph and ran at 6.0 mph on a treadmill using an EMED-SF insole. The subject was a forefoot striker during running. Force data were divided by a computer into forefoot and rearfoot sections. The force-time integral for both sections was then calculated. Split-middle analysis was used to determine differences between the conditions for both walking and running. The results indicate that soft orthoses significantly reduced ($p<.05$): 1) the forefoot FTI during running, but not walking; and 2) the rearfoot FTI during both walking and running. Based on these results, it would appear that soft, accommodative orthoses should be used in runners who require a reduction in vertical force loading in the lower extremity.

THE EFFECTS OF TWO TEN-WEEK PLYOMETRIC REGIMENS ON THE ENHANCEMENT OF LEG POWER

Poole WH, Maneval MW: School of Human Performance and Recreation, The University of Southern Mississippi, Hattiesburg, MS 39406

This study was done to compare the effects of a ten week, three-days-per-week (3DW) and a ten week, two-days-per-week (2DW) depth jumping (DJ) regimen on leg power as measured by vertical jump performance. Seventy-five students of average college age served as subjects for the study (3DW $n=25$, 2DW $n=25$, Control $n=25$). Subjects trained only with DJ. Results indicate that the 2DW routine was significantly better than the 3DW at week four and week ten. There were no differences between the two experimental groups at week six and week eight. Both the treatment groups were significantly better than the control group on the post test. The ten week training cycle did not appear to produce performance plateaus for any group. Although it would seem that leg power, as measured by vertical jump performance, can be significantly influenced by a 2DW DJ routine as outlined in this study, it also appears that a ten week training cycle may not be sufficiently long enough to produce optimum performance.

THE RELATIONSHIP BETWEEN SELECTED ANTHROPOMETRIC MEASUREMENTS AND MUSCULAR STRENGTH CHARACTERISTICS OF INTERCOLLEGIATE WRESTLERS DURING A COMPETITIVE SEASON

Borsa PA, Lephart SM, Fu FH, Utter A, Michael T: Sports Medicine Program, University of Pittsburgh, Pittsburgh, PA 15261

The practice of weight reduction is common in intercollegiate wrestling, and it is speculated that acute fluid deprivation resulting in dehydration is the primary means of weight loss. As a result of these weight reduction practices, selected muscular strength and anthropometric characteristics may be compromised. Body fat and lean body weight (LBW), two components of anthropometry, have been found to fluctuate during weight reduction. This study was performed in order to establish the relationship between selected anthropometric measurements and selected muscular strength characteristics. Twelve intercollegiate wrestlers (mean age = 19.4 yrs, mean ht = 175.6 cm, mean wt = 70.3 kg) were tested to determine the relationship between percent body fat, LBW, and muscular strength during a competitive season. Body fat was measured using a Lange skinfold caliper, and percentages were calculated using equations by Lohman and Brozek. Lower body muscular strength was assessed using a Cybex II isokinetic testing device. Peak torque, torque acceleration energy, total work, and average power were obtained

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for knee flexion and extension at 60°/sec and 240°/sec. Grip strength was used to assess upper body strength. A Lafayette hand held dynamometer assessed static strength of the wrist and finger flexors. Correlation analysis revealed that LBW correlated significantly ($p < 0.01$) with the selected muscular strength characteristics ($r = .70$ to $r = .91$). Correlations between percent body fat and muscular strength characteristics were insignificant ($r = -.32$ to $r = .25$). It is speculated that weight reduction through acute fluid deprivation, resulting in dehydration, may reduce intramuscular water stores; this would decrease LBW and ultimately muscular strength, based on the results of this study. It is recommended that intercollegiate wrestlers avoid acute methods of weight reduction and follow a weight loss regimen. Their intent should be to decrease body fat while maintaining LBW, thus not compromising strength during the weight reduction process.

EVALUATING NORMAL KNEE KINEMATIC DURING BASKETBALL ACTIVITIES AND THE RESULTS OF ACL RECONSTRUCTION IN BASKETBALL PLAYERS

Duby MJ, Ray JM, Shapiro R, Threlkeld JA: Section of Sports Medicine, The University of Kentucky, Lexington, KY 40536

This investigation was performed to examine the effect of forces across the knee joint during normal basketball activities and to incorporate this data into guidelines for athletes returning to basketball after anterior cruciate ligament (ACL) reconstruction. The study included eight elite college basketball players who performed a run-stop, run-cut, and run-stop-jump shot. Three high speed video cameras recorded knee positions while force data was recorded across the knee joint. Isokinetic strength data was collected at 90°/sec and 180°/sec. From 1986 to 1989, fifty-five patients, 35 males and 20 females with an average age of 21.3 years, underwent ACL reconstruction after sustaining a basketball knee injury. Their level of activity ranged from recreational to collegiate athletics. All patients were followed postoperatively for a period of one year. Patient feedback, physical examinations, radiographs, and Genucom and Biodex isokinetic strength testing were collected on all individuals before they returned to play. The effect of knee flexion and ground reaction forces across the normal knee joint during simulated basketball activities was documented. The study also documented the basketball players' return to participation with no limitations following ACL reconstruction.

MOTION ANALYSIS AND JUMP POWER PRODUCTION OF SIMULATED TAKE OFFS IN SKI JUMPING

Ray JM, Shapiro R, Nyland J: Section of Sports Medicine, The University of Kentucky, Lexington, KY 40536

Six members of the United States National Ski Jumping Team participated in performing drop jumps from 40 centimeters, standing vertical jumps with arm swing, and simulated ski jumping take offs with arms behind. Three trials each were performed, recorded, and compared. Force plate data, electromyogram activity of selected muscle groups of the back, buttocks, and lower extremities, high speed video camera recordings, and digitized computer analysis of body markers were recorded. Results of this data demonstrated that jump power is similar but slightly less when comparing the standing vertical jump to the simulated ski jump (vertical ground reaction force = 2.56 x body weight, vertical jump; vertical ground reaction force = 2.33 x body weight, ski jump). The jump heights were similar, but the average height from the ski jump take off position was higher (21.56 inches/vertical jump vs. 22.44 inches/ski jump).

The drop jump demonstrated an initial landing spike and counter movement similar to what has been previously recorded in the literature. Electromyogram sampling demonstrated marked concentric extensor muscle activity in the lower extremities with little activity occurring in the back during the simulated ski jump take off. Jump power becomes important as it generates vertical velocity of the body at take off, thus influencing the flight arc. This biomechanical information about jumping power has influenced training methods by placing an emphasis on isokinetic and plyometric lower extremity extensor muscle work.

EVALUATING THE MECHANISM OF ANKLE INJURIES BY MOTION ANALYSIS OF THE ANKLE IN COLLEGE BASKETBALL PLAYERS

Sternes RA, Ray JM, Threlkeld JA, Shapiro R: Section of Sports Medicine, The University of Kentucky, Lexington, KY 40536

A two-year survey (1987 to 1988, 1988 to 1989) of 8858 high school basketball athletes revealed that ankle sprains were responsible for 53% of their injuries (1745 total injuries). This finding prompted this study of motion analysis of the foot and ankle during the run, jump, and stop. A surface electromyogram (EMG) of the medial gastrocnemius, the ground reaction force, and the three-dimensional motion of the ankle were simultaneously collected from 11 varsity college basketball players. The findings from this study have practical implications in understanding the mechanism of ankle sprains from basketball activities. EMG activity of the medial gastrocnemius was variable during the jump phase and was quite active in an eccentric activity during touchdown/stop; and three dimensional motion of the ankle demonstrated a plantar flexed foot position prior to the touchdown/stop. These findings suggest that pre-season conditioning activities for basketball players should include the use of plyometrics to enhance eccentric muscle activity to the lower extremity.

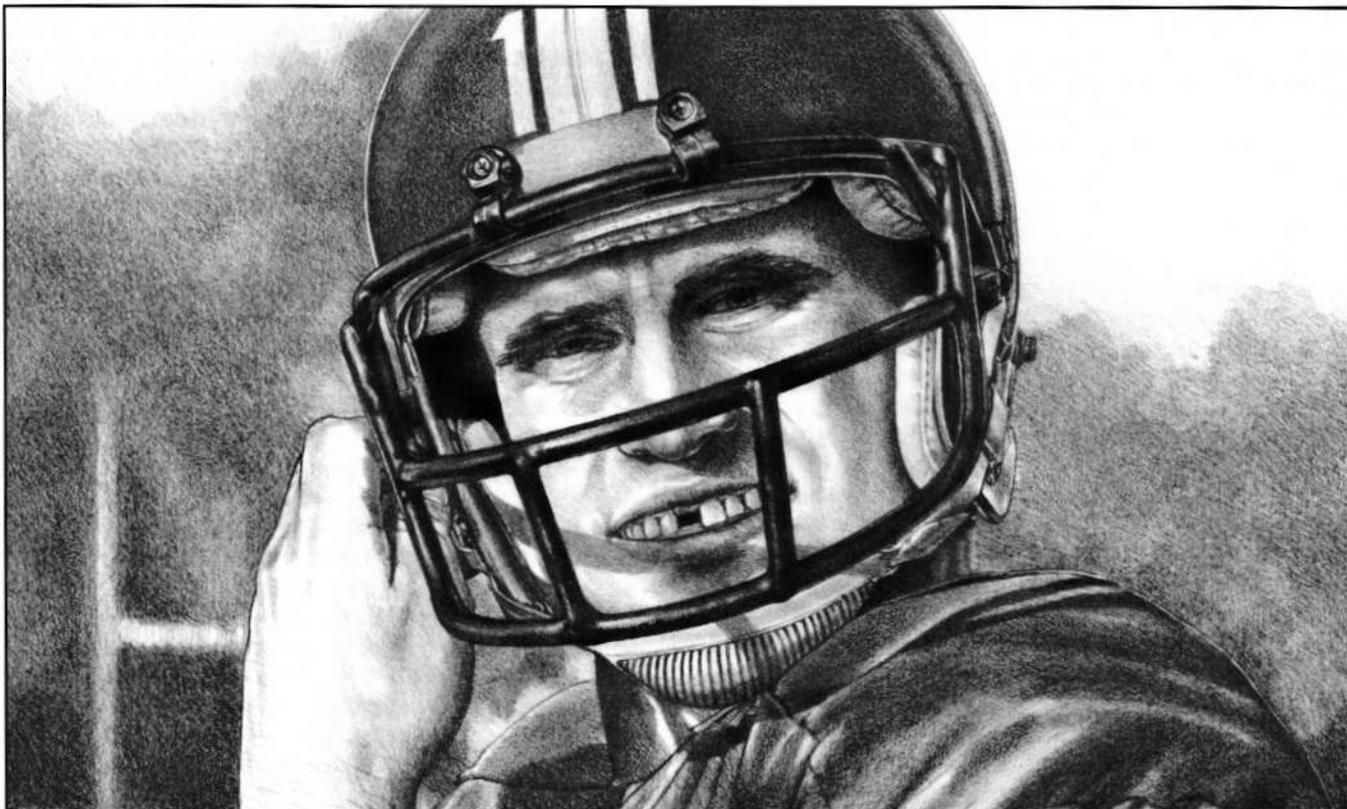
TIME AND REPETITION MEASUREMENT DURING SLIDE-BOARD EXERCISE

Ciolek JJ, Scotton DM, Gilder KA: Section of Sports Medicine, Cleveland Clinic Foundation, Cleveland, OH 44195-5027

The slide-board has been used as a clinical/home rehabilitation and conditioning device. This pilot study was done to investigate the number of repetitions an individual performs during four prescribed work loads on the slide-board. Nine subjects [(7 male, 2 female, mean age=29.1 yrs, mean ht=71.6 in, mean wt=177.4 lbs) (3-s/p ACL knee reconstruction, 1-ACL deficient knee, 5-normal)] performed four stages of exercise on a slide-board. Each subject simulated a speed skating technique sliding from the right bumper (RB) to the left bumper (LB) and back. The number of repetitions (1 rep = a completed full cycle of sliding, consisting of drive and extension from RB to LB and back to the original starting bumper) was counted. Subjects rated the difficulty of exercise using a Modified Borg Perceived Exertion Scale (0=easiest, 10=hardest).

	Distance RB to LB	Rest	Mean Reps	Rating
Stage I (30 sec)	5.9 ft	90 sec	13.3 (10-18)	2.1
Stage II (60 sec)	5.9 ft	120 sec	27.3 (23-32)	3.2
Stage III (30 sec)	6.9 ft	90 sec	12.6 (11-16)	2.8
Stage IV (60 sec)	6.9 ft	—	26.4 (22-34)	3.8

This pilot investigation demonstrated that individuals with a reconstructed ACL and other healthy athletes were able to use the slide-



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board with light to moderate effort. This study will help clinicians outline a program for knee rehabilitation and over-all conditioning to be used in a home or clinic setting. Further investigation of the slide-board exercise is necessary to establish more specific protocols for various rehabilitation programs.

HABITUATION TO COLD-PAIN DURING REPEATED CRYOKINETIC SESSIONS

Carman KW, Knight KL: Sports Injury Research Lab, Indiana State University, Terre Haute, IN 47809

Clinicians claim that athletes habituate to cold induced pain during cryokinetics treatments, but this has never been tested. We treated the right ankle of 38 subjects for 8 days in either 1° or 5 °C water. On days 9 and 10, the opposite temperature and the opposite ankle (left) were treated. Cold induced pain was recorded 5 x/day (after each ice immersion) using Borg's Perceived Pain Scale and the McGill Pain Questionnaire. There was a sharp decrease in pain from days 1 through 5, but no difference between days 5 through 8. Pain during session one was significantly greater than during all other sessions for all days except day one. Location of the pain changed between days, but not between sessions. On days 9 and 10, pain in the opposite limb was greater than pain at the end of habituation, but similar to day one of habituation. Application with a lower temperature resulted in greater pain than that perceived at day eight. These data indicate that habituation does occur during cryokinetics, and that it is specific to body part and temperature used.

THE EFFECTS OF WARM-UP ON ACUTE HIP JOINT FLEXIBILITY USING A MODIFIED PNF STRETCHING TECHNIQUE

Cornelius WL, Hands MR: Division of Kinesiology, University of North Texas, Denton, TX 76203

This investigation was initiated in order to determine the effects of warm-up techniques on a slow-reversal-hold-relax (SRHR) modified proprioceptive neuromuscular facilitation (PNF) flexibility maneuver. Subjects (n=54) were active, injury-free females who were randomly assigned to stationary cycling, whirlpool, or control groups. Each group participated in its assigned treatment for twenty minutes and did not perform any stretching exercises before or during the warm-up conditions. Acute flexibility data were collected for hip flexion with the use of a Leighton Flexometer during treatment conditions. An analysis of variance (ANOVA) indicated that no significant interaction occurred between warm-up and control conditions when followed by a SRHR stretching technique. The data from this study demonstrated that there is no warm-up effect on flexibility under PNF conditions.

TEMPERATURE AND PAIN CHANGES RESULTING FROM POST SURGICAL (ARTHROSCOPY) APPLICATION OF COLD PACKS

Creager CL, Knight KL: Athletic Department, The College of Wooster, Wooster, OH 44691

To determine the effects of post-surgical cold pack application, twenty-one arthroscopic surgery patients were studied. They were divided into three groups. Two groups were treated with cold packs (Dura*Kold or Aircast Cryo/Cuff) for three hours directly following surgery; the third group (control) received no treatment. Six dependent variables were examined: subjective pain ratings three and 48 hours after surgery, a subjective rating of functional activity 48 hours after surgery, skin temperature for three hours after surgery, and pain

medication consumed during three hours and 48 hours post-surgery. Average knee surface temperature in those subjects treated with Aircast Cryo/cuff and Dura*Kold packs was less than in control subjects. Subjective pain ratings were lower in subjects treated with cold applications three hours post-surgery, but not when treated 48 hours post-surgery. The functional activity level was not significantly different between the three groups. A single cold application for three hours is beneficial for outpatient arthroscopy patients, and should be encouraged. Further research should determine if longer or repeated applications of cold would cause a greater decrease in pain and improve functional activity.

THE INJURY EXPERIENCE OF THE ATHLETE WITH A DISABILITY

Ferrara MS, Buckley WE: Ball State University, Muncie, IN 47306

For this project, we described the injury experience of the athlete with a disability. A cross-disability instrument was developed to measure the variables of interest. A retrospective survey was administered to 426 athletes who participated at the 1989 national games of the National Wheelchair Athletic Association (NWAA), the United States Association for Blind Athletes (USABA), and the United States Cerebral Palsy Athletic Association (USCPAA). Each of these organizations offers a variety of sports, including track, field, weight lifting, and swimming. The NWAA athlete competes in a wheelchair, the USABA athlete competes ambulatorily, and the USCPAA may compete either in a wheelchair or ambulatorily depending upon the involvement and the severity of the cerebral palsy. Injury is defined as any trauma to the participant that occurs during any practice, training, or competitive session, which causes the athlete to stop, limit, or modify participation for one day or more. Thirty-two percent of the respondents reported at least one injury. Chronic injuries (55%) were slightly more prevalent than acute injuries (45%). Shoulder injuries occurred with the greatest frequency at 22%, leg/ankle injuries at 17%, and knee injuries at 15%. Within group comparison revealed the following information: for the NWAA athlete, shoulder injuries accounted for 40% followed by arm/elbow injuries at 17%; for the USABA athlete, leg/ankle injuries were 26%, shoulder injuries were 15%, and leg/ankle and fingers injuries were 11% each; for the USCPAA athlete knee injuries were 21%, followed by the shoulder and leg/ankle injuries which were 17% and 15% respectively. Athletes who had a disability incurred injuries at approximately the same rate as athletes without a disability. An injury prevention program should focus on improving the strength and flexibility of the major joints. Further, the athletic trainer should evaluate the mechanics of locomotion whether by wheelchair or ambulation in order to determine the appropriate gait and propulsion techniques for reducing the number of injuries.

INTERCOLLEGIATE ICE HOCKEY INJURIES: A THREE YEAR ANALYSIS

McKnight CM, Ferrara MS: Ball State University, Muncie, IN 47306

This study was done in order to investigate the type, nature, and frequency of injuries sustained in intercollegiate ice hockey. Seven schools from the Eastern Collegiate Athletic Conference and Hockey East participated from 1987 to 1990. The athletic trainer was the recorder of calendar and injury data. An injury was defined as any accident or illness that resulted in a loss of practice/game time. There were 270 injuries reported with a total exposure rate of 5.44/1000

athletes exposure (AE). Contest exposure at 14.73/1000 AE was significantly higher than practice exposure, 2.52/1000 AE. Of the total injuries sustained, 55.4% were in game/scrimmage situations and 30.1% in practice, while 14.5% were non-sport related. Acute injuries accounted for 77.5% of those reported. Forwards had the greatest frequency of injury at 57.2%, with 40.9% of those occurring to the right wing. The defense accounted for 31.3% and the goalie for 10.1%. Over 69% of all injuries were sustained by a direct impact. Of those, persons/ice contact was 52.4%, boards 24.6%, puck 12.2%, stick 7.3%, and goal 1.3%. The shoulder and knee were the most frequently injured body parts at 16.1% and 14.2% respectively, followed by head/face 9.5%, groin/hip 9.2%, and thigh 8.9%. The most common types of injuries were contusions 28.8%, sprains 26.9%, strains 13.0%, illnesses 11.4%, and lacerations 8.5%. Minor injuries (7 days or less) accounted for 63.0%, moderate (8-21 days) 23.4%, and major (over 21 days) 13.6%. Knee injuries constituted 34.9% of the severe injuries, and shoulder and ankle injuries were each 18.6%. The data reported are consistent with that of other studies, which show that contusions are the most common type of injury and a that higher incidence of injury occurs during competition. What is unique is the low incidence of head/face injuries, the severity of knee injuries, and the high rate of injury resulting from board collisions. The low head/face rate may be due to the required use of helmets and face guards in this population. Over 71% of the knee injuries resulted from some type of impact, which points to the need to evaluate knee protection. Board collisions have not been selectively identified in many studies. The incidence seen here suggests that board type and construction may be important factors in injury prevention, and this warrants further study.

THE RELATIONSHIP BETWEEN PAIN AND PERSONALITY CHARACTERISTICS

Buxton BP, Perrin DH: San Jose State University, San Jose, CA 95192-0054

The role and responsibilities of the athletic trainer include the care, evaluation, treatment, and subsequent rehabilitation of athletic injuries. The primary complaint of most injured athletes is pain. The onset, duration, and amount of pain are paramount concerns of the individual who is experiencing pain. Results of this investigation determined the relationship between personality characteristics and an acute pain response. It was hypothesized that a strong relationship would exist between personality characteristics and pain response. Subjects included 107 male, military school cadets (mean age = $18.60 \pm .58$ yrs). Each subject performed a Cold Pressor Test (CPT)

and was evaluated for pain threshold and pain tolerance times. The subjects were then evaluated for eight personality characteristics: extraversion (E), introversion (I), sensing (S), intuition (I), thinking (T), feeling (F), judging (J), and perception (P). The personality characteristics were measured by the Myers-Briggs Type Indicator (MBTI) form G. The results indicate that there is no relationship between the eight personality characteristics measured by the MBTI (form G) and the pain threshold or pain tolerance. Findings also indicate that there was a low correlation between pain threshold and pain tolerance ($r=.25$). These results suggest that an individual's acute pain response is not associated with personality characteristics. Therefore, personality characteristics are not a reliable indication of an individual's ability to tolerate acute pain. The results also indicate that pain threshold is not an accurate indicator for pain tolerance. Individuals who experience high levels of pain immediately following injury, may actually be able to tolerate that pain over a longer period of time and vice versa. The findings of this investigation should encourage the clinician to evaluate the individual, as well as the individual's injury.

COMPARISON OF THREE SLIDE-BOARD ENDPLATES DESIGNED TO GENERATE MAXIMUM FORCE

Deivert RG: Department of Human Performance, San Jose State University, San Jose, CA 95192 -0054

Various types of slide-boards are being used today for the conditioning and rehabilitation of athletes. Research findings have yet to conclusively indicate the supremacy of one optimal angle for the slide-board endplate. Results of this study determined which angle resulted in the greatest applied vertical force. Twenty-four male college students (mean age=23.5 yrs) majoring in Human Performance volunteered to participate in the study. Subjects performed the single leg push-off phase on a slide-board with the adjustable end plate set at 20°, 40°, and 90°. Vertical force values (N) were measured with the Kistler force plate system. The mean values of ten trials (dominant leg) at each angle were recorded. The one-way ANOVA performed on the absolute force values revealed a significant main effect for the endplate angle ($p<.05$). The 40° angle resulted in an average force of 640N, the 90° angle resulted in an average force of 580N, while the 20° angle produced an average force of 544N. The results of this study indicate that the endplate of 40° was more effective in producing greater force than the 90° or 20° endplates. These findings confirm the speculation that the optimal angle for efficient application of force on a slide-board endplate approximates 40°.

Menstrual Disorders Among Intercollegiate Athletes and Non-Athletes: Perceived Impact on Performance

Preventive Medical Care for the Female Athlete

Carol A. Wilson, PhD

Thomas E. Abdenour, ATC

William R. Keye, MD

ABSTRACT: Sixty-two (62) female intercollegiate athletes and 88 nonathlete females were surveyed for menstrual disorders. The survey requested information concerning the timing and duration of menses, as well as the presence or absence of oligomenorrhea, bleeding at irregular intervals of 40 days or more; and dysmenorrhea, painful menstruation. The survey also requested the reporting of premenstrual symptoms (a combination of time-delineated physical, emotional, social and/or behavioral symptoms that occur before menstruation and regress or disappear during menstruation), the occurrence of which interferes with quality of life; and amenorrhea, an absence of menses for at least six months. In addition, the athletes were asked if dysmenorrhea and premenstrual symptoms decreased their athletic performance. Twenty-one percent of the athletes experienced amenorrhea, significantly more than the nonathletes, who reported no occurrences of amenorrhea. Both 16% of the athletes surveyed and 16% of the nonathletes reported oligomenorrhea; 74% of athletes and 80% of nonathletes reported dysmenorrhea. Similar percentages reported premenstrual symptoms—84% of athletes and 85% of nonathletes. Also reported by 50% of the athletes was the belief that dysmenorrhea and premenstrual symptoms hinder their athletic performance. These results suggest that female athletes are not less likely to experience menstrual disorders than nonathletes. Thus, athletes should be screened for these disorders, not only to enhance athletic performance and quality of life, but to help preserve their health and reproductive potential.

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During the past decade there has been a dramatic increase in the number of women participating in competitive athletics. As a result, strenuous conditioning and training programs for women athletes also have increased. There has been little research, however, on the effects of training on gynecologic function, and guidelines have not been established for preventive care and medical evaluation of female athletes for menstrual disorders. Many college and university physical examinations and medical questionnaires are nearly identical for men and women, with emphasis on the cardiovascular, skeletal, and neuromuscular systems. These assessments usually do not include an evaluation of menstrual and gynecologic function.

Although studies have demonstrated that asymptomatic female athletes function as well physiologically during menstruation as during other phases of their menstrual cycle (1,2,3,14,23,39), these studies are often misinterpreted as being representative of all female athletes. These studies did not address the athletic performance of those who are aware of and distracted by dysmenorrhea or premenstrual symptoms. Our observations suggested that menstrual disorders among women athletes, including dysmenorrhea and premenstrual physical, emotional, and behavioral symptoms, occasionally interfered with athletic performance. In addition, it appeared that most of the female athletes, and their coaches or athletic trainers (most of whom are male, without menstrual experience), were unaware of the medical basis and treatments of these disorders. Furthermore, it became apparent that the physical and emotional stress of training and competition could affect menstrual function, sometimes resulting in the cessation of regular menstrual periods. Thus, we surveyed 62 intercollegiate athletes and 88 nonathletes to compare and determine the prevalence of menstrual disorders: amenorrhea, dysmenorrhea, premenstrual symptoms, and oligomenorrhea. The athletes' perceived effect of these

disorders on athletic performance was noted, and a procedure was developed for evaluating menstrual disorders in female athletes.

METHODS

Sixty-two (62) intercollegiate female athletes and 88 nonathletes from Weber State University were surveyed for menstrual disorders. An 11-item self-report questionnaire requested: personal information; information concerning the timing of menstrual periods; and information regarding the presence, severity, and nature of amenorrhea, oligomenorrhea, dysmenorrhea, and premenstrual symptoms. In addition, each athlete was asked to determine whether or not she believed that dysmenorrhea and premenstrual symptoms affected her athletic performance, and what medical and/or non-medical means she uses to deal with these symptoms. Differences between the groups were calculated with a two-tailed Student t-test. Differences in the frequency of menstrual disorders were calculated using a chi-square analysis.

RESULTS

One hundred percent (100%) of the 62 intercollegiate athletes and 88 nonathletes responded to the questionnaire. There was a significant difference ($p < .05$) in the mean age between the athletes (18.6 ± 0.7 yrs) and nonathletes (24.1 ± 1.6 yrs), representative of a university where competitive athletes are younger than the overall university population. There was no significant difference in age of menarche between the athletes (13.7 ± 0.3 yrs) and nonathletes (12.9 ± 0.6 yrs).

The athletes included women from six sports and all three athletic seasons: track/cross country (16), basketball (14), volleyball (12), tennis (8), golf (6), and competitive cheerleading (6). They exercised five days a week for two hours per session. The nonathletes exercised an average of three days per week for approximately 30 minutes per session. There were no significant differences in reported eumenorrhea (regular menstrual periods) between athletes (77%) and nonathletes (84%). There also were no significant differences in reported oligomenorrhea between athletes (26%) and nonathletes (16%). However, most of the oligomenorrheic athletes were also amenorrheic; thus, there was a significant difference in reported amenorrhea ($p < .0001$) between the athletes (21%) and the nonathletes (0%) (Table 1).

Dysmenorrhea was reported in 74% of the athletes and in 80% of the nonathletes (Table 1). Among those athletes with painful menstruation, 23% rated their pain as mild, 34% as moderate, and 18% as severe. The nonathletes reported similar ratings; however, the nonathletes reported significantly more severe dysmenorrhea ($p < .005$). Twenty-three percent of the non-athletes rated their pain as mild, 31% as moderate, and 26% as severe. More than half of the athletes reporting dysmenorrhea (59%) perceived a decrease in their athletic performance. However, only 28% of these athletes used prescription medication for pain relief. These medications included non-steroidal anti-inflammatory agents, oral contraceptives, or analgesics. The majority of athletes used over-the-counter medications (Midol™ or aspirin), rest, or

exercise for pain relief.

Even more common than painful menstruation were premenstrual physical, emotional, and behavioral symptoms, which were reported by 84% of the athletes and 85% of the nonathletes (Table 1). Thirty-nine percent of the athletes rated their symptoms as moderate or severe, whereas 49% of the nonathletes rated their symptoms as moderate or severe. The most common symptoms reported were irritability, tension, anger, binge-eating, abdominal bloating, breast tenderness, fatigue, poor concentration, and emotional lability or moodiness. Fifty percent of the athletes who reported premenstrual symptoms perceived that these symptoms interfered with their athletic performance. Only three of these athletes used prescription medication for their symptoms, and nearly half of the athletes did not take any measure to reduce the severity or impact of their premenstrual symptoms. One athlete, however, reported that she attempted to eliminate her symptoms by drinking a six-pack of beer.

Table 1. Athlete and nonathlete menstrual data

	Athletes (n=62)	Nonathletes (n=88)	Chi-square
Eumenorrhea	48 (74%)	74 (84%)	1.05
Oligomenorrhea	16 (26%)	14 (16%)	2.22
Amenorrhea	13 (21%)	0 (0%)	20.22 *
Dysmenorrhea	46 (74%)	70 (80%)	.55
Mild	14 (22%)	20 (23%)	.01
Moderate	21 (40%)	27 (31%)	.16
Severe	11 (18%)	23 (26%)	1.50
Decreased Athletic Performance	37 (59%)	NA	
Premenstrual Syndrome	52 (84%)	75 (85%)	.04
Mild	28 (45%)	31 (35%)	1.50
Moderate	22 (36%)	30 (34%)	.03
Severe	2 (3%)	13 (15%)	8.20 *
Decreased Athletic Performance	31 (50%)	NA	

Percentages of severity of dysmenorrhea and PMS refer to the number of subjects who reported these symptoms.

* $p < .005$

** $p < .0001$

DISCUSSION

One possible explanation for lack of gynecologic knowledge and screening protocol for female athletes is a prevailing attitude that female athletes are "healthier" than nonathletes, and thereby are immune from gynecologic disorders. However, the literature contains reported observations of menstrual disorder in the female athlete noted as early as 1926 by Billhuber (3). This hypothesis was indirectly tested in 1939 by Selye (28) who reported that, with exercise, adaptive changes

occurred to the reproductive systems of female rats.

Since Selye's research (28), the prevalence of menstrual irregularities among competitive athletes has been reported in a number of studies (1,2,4,9,10,11,14,23,29). Delayed puberty has been noted in athletes and ballet dancers (17,18,35). Greater prevalence rates of amenorrhea have been reported among female athletes (16,34), and recently, osteoporosis, a disorder characterized by abnormal rarefaction of bone, has been noted in amenorrheic long distance runners (9,10,12,13,22,24). Although exercise has been reported to decrease premenstrual symptoms, a diagnosis of premenstrual syndrome was not established among the research subjects (26,34), a common methodological shortcoming in PMS research literature (37). On the contrary, Erdelyi (15) reported her observations, and those of others, that poor athletic performances, depression, and lack of stamina among competitive female athletes were found overwhelmingly in the premenstruum and in the first two days of menstruation. Finally, a shortened menstrual cycle luteal phase has been noted in female athletes (27,30,31), and luteinizing hormone (LH) pulse frequency studies have demonstrated an alteration of gonadotropin-releasing hormone pulsatile patterns in eumenorrheic (normally menstruating) female runners (11).

The results of this study demonstrate that athletes are not less likely than nonathletes to experience menstrual disorders. In fact, the prevalence of amenorrhea is significantly greater in athletes. Although studies have demonstrated that asymptomatic female athletes function as well physiologically during menstruation as during other phases of their menstrual cycle (1,2,3,14,39), the studies do not include the athletic performance of those who are aware of and distracted by dysmenorrhea and premenstrual symptoms. It is possible that they do not perform as well in the presence of these symptoms. Furthermore, there were methodological research problems, including menstrual cycle phase definition, determination of hormonal state, response bias, and generality of results (32). In this survey, the female athletes with menstrual disorders reported that they had missed practices, practiced or performed with less intensity, and had been less coachable because of these symptoms. Thus, it appears that menstrual disorders may have at least an indirect impact on their athletic performance. Clearly, a controlled prospective study of the impact of menstrual disorders and their treatment is needed to determine the validity of our retrospective self-reporting survey.

Amenorrhea

The presence of amenorrhea may be an indication of medical disorders, such as anatomical abnormalities, absence of ovulation, delayed puberty, premature menopause, anorexia nervosa, hypothyroidism, androgen disorders, prolactin producing pituitary tumors, and rarely, chromosome abnormalities (33). Amenorrhea may also indicate the use of anabolic steroids.

Our results suggested a significant relationship between competitive athletics and amenorrhea, which has been documented in numerous studies of athletes involved in strenuous activities such as running, swimming, and ballet dancing

(4,17,18,20,29,35).

Only recently has it become apparent that exercise-induced amenorrhea and decreased levels of estrogen predispose some female athletes to reduced bone density (9,10,12,13,22,24). Several studies have reported a lower vertebral bone mineral density (BMD) among young amenorrheic athletes than among nonathletes, or among athletes with regular cycles (9,10,12,13,24). Because osteoporosis can cause pathologic fractures, stress fractures, loss of stature, various deformities, and pain, particularly in the lower back, treatment of amenorrheic athletes must be initiated early, perhaps within the first two or three years, to prevent or reverse bone loss (17).

Further research is needed to substantiate studies that have suggested that menstrual irregularity in athletes is temporary and that menstruation resumes when training is interrupted or decreased (13,15). In a study conducted by Drinkwater et al. (13), six of seven amenorrheic athletes who resumed menses also demonstrated a marked increase in vertebral bone density. Nevertheless, the athlete with prolonged amenorrhea should have bone mineral content analysis to determine bone loss and to evaluate a possible adjustment in intensity of training or to add hormone replacement therapy with estrogen and progesterone (Table 2).

Table 2. Preventive-medical care model for the female athlete

Self-Help Measures

<u>Amenorrhea</u>	<u>Dysmenorrhea</u>	<u>Premenstrual Symptoms</u>
•Stress reduction	•Rest or exercise •Heat •Over-the-counter anti-prostaglandins	•Adequate rest/sleep •Aerobic exercise x 30 minutes •Decreased salt, sugar, and caffeine •Frequent small meals •Stress reduction

Medical Care (If symptoms are severe or persist)

<u>Amenorrhea</u>	<u>Dysmenorrhea</u>	<u>Premenstrual Symptoms</u>
•Hormone replacement therapy •Birth control pills •Estrogen plus progestin •Treatment of underlying endocrine disorder	•Anti-prostaglandins (prescription strength) •Inhibition of ovulation (medroxyprogesterone acetate) •Laparoscopy •Treatment of pathology (infection or endometriosis)	•Anti-prostaglandins (prescription strength) •Inhibition of ovulation (Medroxyprogesterone acetate) •Progesterone therapy

Dysmenorrhea

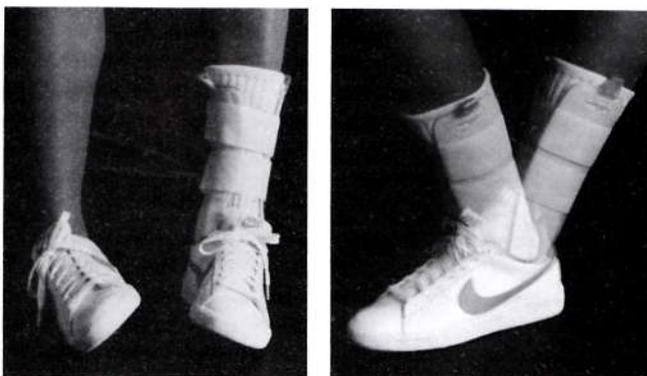
It was only a decade ago that dysmenorrhea was thought to be a psychophysiological disorder resulting from rejection of the female role, rejection of femininity, emotional stress, or neurosis (36). Fortunately, medical research beginning in the 1970s demonstrated that dysmenorrhea in the absence of

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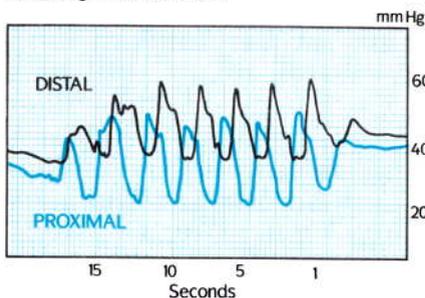
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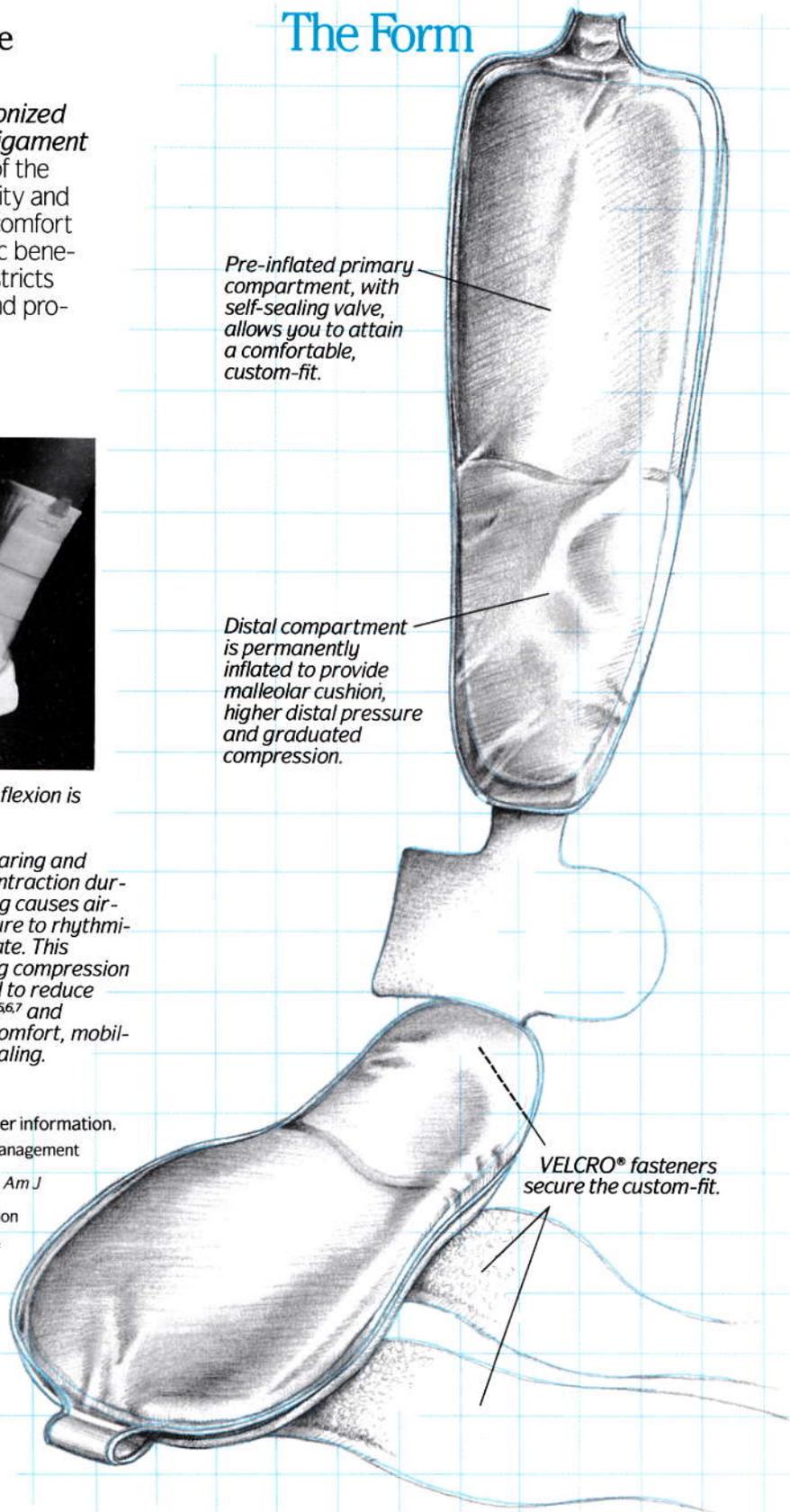
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pelvic pathology, such as infection or endometriosis, is primarily the result of the production and release of prostaglandins by the uterus during menstruation (36). Thus, anti-prostaglandin therapy is now recommended instead of ignoring symptoms or providing patronizing suggestions. When anti-prostaglandin therapy is ineffective, however, pelvic pain can be an indication of underlying gynecologic disease such as uterine anomaly, infection, and/or endometriosis (Table 2). Endometriosis, a disorder found in adolescents and adult women, occurs when endometrial tissue becomes displaced outside of the confines of the uterus (19). Because this tissue responds to hormonal fluctuations, the endometrial tissue continues to bleed and can cause severe pain, scarring of reproductive and other organs, and a loss of fertility (25).

Women and athletes have been conditioned to ignore "just cramps" or menstrual pain, not realizing that pain can be an indication of pathology. These results indicated that the majority of athletes studied experienced dysmenorrhea. Furthermore, most of those athletes believed that dysmenorrhea interfered with their ability to train or compete. Surprisingly, less than one-third of this group used prescription medication to alleviate their discomfort; the majority used over-the-counter medications with poor or incomplete relief of their symptoms. Thus, it is important to screen for dysmenorrhea, not only to enhance athletic performance through appropriate treatment, but to preserve the reproductive potential of the athlete.

Premenstrual Symptoms

Ironically, premenstrual symptoms now are viewed as dysmenorrhea was viewed a decade ago: as an enigma caused by personal inadequacy, weak character, neurosis, or psychosocial stress (36). Thus, premenstrual symptoms are often ignored and untreated. More than 150 physical, psychological, and social/behavioral symptoms have been attributed to premenstrual syndrome (38). However, isolated physical symptoms, known as menstrual molumina, are experienced by the majority of menstruating women and should not be confused with PMS.

Years of undetected and untreated premenstrual depression, anxiety, irritability, and extreme fatigue often result in decreased self-esteem, disturbed relationships, unfinished education, and loss of employment. Effective self-help and medical therapies are now available (Table 2). Further therapy for PMS is found in a multifactorial, multidimensional approach, characteristic of the biopsychosocial model, which recognizes the roles of various stressors, the relationships of other psychogenic disorders, and the influence of socio-cultural factors on PMS (21,38). However, the etiology and pathophysiology of premenstrual syndrome remains unknown, a source of enigmatic controversy.

In spite of the popular belief that exercise reduces the severity of premenstrual symptoms (8,26,34), our findings suggest that the competitive female athlete experiences premenstrual symptoms as often and as severely as do non-athlete women. In addition, the majority of the athletes believed that premenstrual symptoms decreased their athletic performance and utilized either no or ineffective methods of

treatment. The athletes verbally communicated that few had gynecologic histories and exams. Thus, the women not only had potentially undiagnosed and untreated menstrual disorders, but often used non-medical and ineffective means of dealing with uncomfortable and painful symptomatology. Therefore, a model program for the screening and evaluation of gynecologic disorders is recommended.

RECOMMENDATIONS

A model program of screening and evaluating the female athlete would include the following components:

- An educational group discussion with the athletes, their coaches, and their athletic trainer(s) regarding common menstrual disorders, evaluation and treatment of disorders, self-help measures, and the potential impact of these disorders on athletic performance.
- Annual use of a gynecologic health evaluation form (Figure 1).
- An individual interview (conducted by the team physician) with each athlete who reports gynecologic symptoms, with possible referral to a gynecologist or reproductive endocrinologist.
- A gynecologic and/or endocrinologic examination for a selected group of those athletes who were interviewed and found to have symptoms that suggest gynecologic disease.
- Treatment or prophylaxis of the gynecologic problem as shown in Table 2.
- Monthly monitoring of the gynecologic problem by the athletic trainer and of its impact, if any, on athletic performance.

Whether or not menstrual disorders interfere with athletic performance, remains a quandary. Such a determination will require sophisticated and detailed studies on the effect of these disorders on motivation, concentration, endurance, reaction time, strength, speed, and other physiologic parameters.

CONCLUSION

There is often the misleading assumption that female athletes are not only more physically fit, but healthier (complete physical, emotional, spiritual, and social well-being) than nonathlete women. Most athletic trainers and coaches would not suspect that the prevalence and severity of menstrual disorders among athletes equals or exceeds that of non-athlete women. Unfortunately, this assumption is probably much of the basis for lack of screening criteria in mandatory medical evaluation assessments for women athletes.

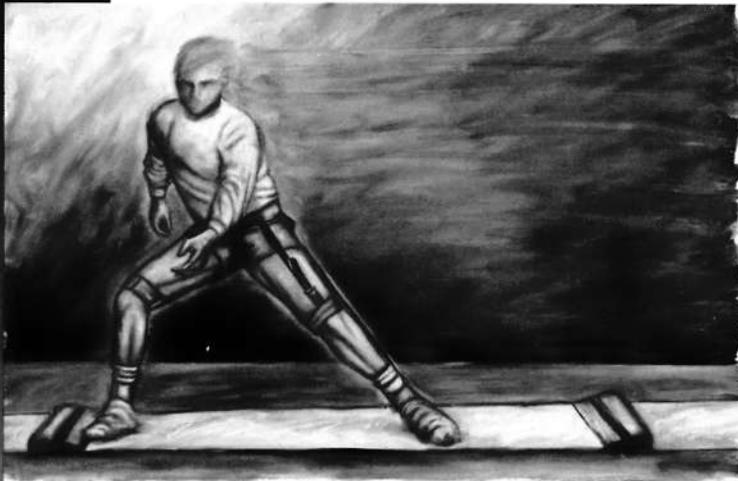
The results of this survey demonstrate that female athletes experience significantly more amenorrhea than non-athletes. However, there is no significant difference in reported dysmenorrhea and premenstrual symptomatology between athletes and nonathletes. Furthermore, the athletes believed that dysmenorrhea and premenstrual symptomatology decreased their athletic performance. The majority of these athletes sought either no or ineffective means of treating these symptoms. Therefore, we believe that the educational and medical screening protocol outlined in this study is a

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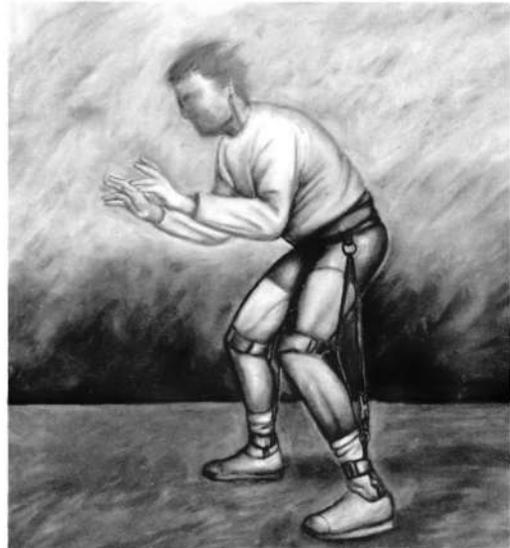
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1. Age _____

2. Do you have regular menstrual periods? Yes ___ No ___

3. Do you have menstrual cramps with your period? Yes ___ No ___

4. If you do have menstrual cramps, are they: Mild ___ Moderate ___ Severe ___

5. If you do have menstrual cramps, do they result in:

a. Decreased ability to concentrate, study, or take tests Yes ___ No ___

b. Time missed from classes Yes ___ No ___

c. Please explain _____

6. What do you do to relieve your cramps? _____

7. Do you experience emotional or physical changes during the week or two before your period begins? Yes ___ No ___

8. If yes, are the changes Mild ___ Moderate ___ Severe ___

9. If yes, list the major changes you experience during the week or two before your period. Examples include acne, bloating, weight gain, breast tenderness, depression, craving for food or sweets, depression, anger, fatigue, arguing with friends or relatives, social withdrawal.

Physical	Emotional	Social
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
4. _____	4. _____	4. _____
5. _____	5. _____	5. _____

10. If yes, do your premenstrual symptoms result in:

a. Decreased ability to concentrate, study, or take tests Yes ___ No ___

b. Time missed from classes Yes ___ No ___

c. Please explain _____

11. What do you do to relieve your premenstrual symptoms? _____

Figure 1. Menstrual disorder questionnaire

practicable tool to help prevent, detect, and/or treat menstrual disorders. It seems only logical to conclude that the health, reproductive capacity, and psychological well-being of the female athlete is an antecedent—not a by-product—of peak athletic performance.

ACKNOWLEDGEMENTS

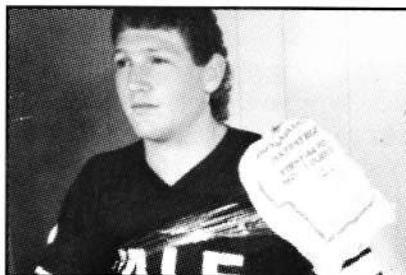
We appreciate Gary Crompton, former athletic director of Weber State University, and Nancy Weir, ATC, for their cooperation in the facilitation of this study.

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Athletic Training in an Undergraduate Sport Management Curriculum

Crayton L. Moss, EdD, ATC
Janet B. Parks, DA

ABSTRACT: Traditionally, undergraduate level athletic training curricula have prepared students for positions as teachers and athletic trainers in secondary schools. NATA Professional Education Committee placement data indicate, however, that most graduates of baccalaureate degree athletic training programs from 1985 to 1990 have been employed in private sector settings, e.g., sports medicine clinics, hospitals, professional sport, or industrial fitness programs. This evidence suggests that curricula should be developed to prepare students for positions requiring not only the science-based expertise traditionally associated with athletic training, but also the business-related expertise associated with management positions in private settings. This paper presents a model in which an athletic training curriculum is included in an undergraduate sport management program. Futurists have predicted an expansion of the concept of wellness centers, and the evolution of a new type of community center in which athletic programs will be similar to contemporary school-based programs. Athletic trainers prepared through curricula such as this one will be prepared for this new environment.

Traditionally, college and university undergraduate athletic training curricula have focused on providing preparation for students planning to teach and work with athletes in secondary schools. Currently, however, there is a measurable trend toward employment of athletic trainers in settings other than secondary schools, e.g., hospitals, sports medicine clinics, professional sport, and industrial fitness programs. The authors of this paper, therefore, present an analysis of place-

ment data collected from graduates of baccalaureate degree athletic training programs between 1985 and 1990; and they suggest an innovative approach to curriculum development that offers options reflective of national trends suggested by the data.

PLACEMENT DATA

In 1988, Grace (4) stated, "Independent and hospital-based clinics, which employ about 1200 athletic trainers today, are expected to provide twice as many positions for athletic trainers in 1994." He added, "American industry, which has fewer than 50 certified trainers on the payroll today, is expected to provide career opportunities for 1000 athletic trainers in 1994." Grace (4) also predicted that, of the approximately 4000 new athletic trainers expected to be NATA-certified by 1994, 2150 would be employed in the private sector, and only 1200 would work in high schools and colleges.

Data published by the National Athletic Trainers' Association Professional Education Committee (7) agree with Grace's predictions. In 1990, 554 students were graduated from undergraduate athletic training programs. As shown in Table 1, 233 of these graduates were employed as athletic trainers in either secondary schools, colleges, professional sport, clinics, or other settings related to athletic training. Secondary schools employed 27% of these, while 66.5% were employed in sports medicine clinics or in "other" settings related to athletic training (Table 1). When the 11 graduates employed in colleges and the four employed in professional sport were added to the "non-secondary school" category, the proportion of 1990 graduates employed outside the secondary school setting rose to 72.9%.

In 1990, 72.4% of the 145 athletic trainers employed at sports medicine clinics had duties as athletic trainers at the secondary school level (7). This suggests a trend among boards of education toward contracting the services of athletic trainers rather than employing them as teachers/athletic trainers in the schools. Regardless of philosophical positions opposing this practice, it is important for individuals who

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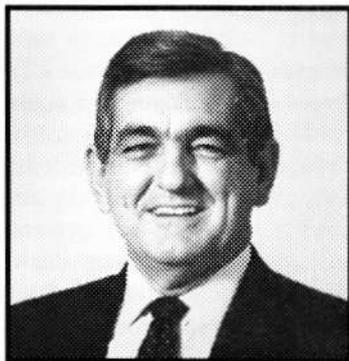
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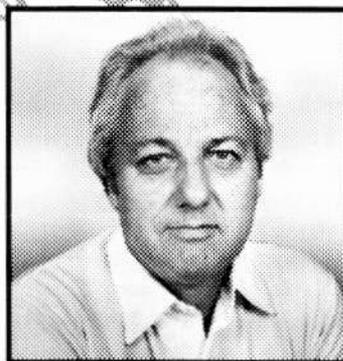
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Table 1. Undergraduate athletic training graduates employment 1985-1990* (number and percent of setting total)

Sites	Year of Graduation						Total
	1985	1986	1987	1988	1989	1990	
Athletic Training Settings							
Secondary School	48 (39.7%)	55 (40.7%)	40 (26.1%)	34 (21.9%)	52 (28.0%)	63 (27.0%)	292 (29.7%)
College	22 (18.2%)	10 (7.4%)	19 (12.4%)	22 (14.2%)	11 (5.9%)	11 (4.7%)	84 (9.7%)
Pro Sports	6 (5.0%)	6 (4.4%)	9 (5.9%)	10 (6.5%)	4 (2.1%)	4 (1.7%)	39 (4.0%)
Clinics	35 (28.9%)	55 (40.7%)	78 (51.0%)	79 (51.0%)	102 (54.8%)	145 (62.2%)	349 (50.2%)
Other Related	10 (8.3%)	9 (6.7%)	7 (4.6%)	10 (6.5%)	17 (9.1%)	10 (4.3%)	53 (6.4%)
Totals AT	121 (100%)	135 (100%)	153 (100%)	155 (100%)	186 (100%)	233 (100%)	983 (100%)
Nonathletic Training Settings							
Graduate School	122 (57.3%)	168 (63.9%)	122 (63.2%)	137 (64.9%)	184 (65.0%)	221 (68.8%)	954 (64.3%)
Other than AT	54 (25.4%)	37 (14.1%)	31 (16.1%)	26 (12.3%)	41 (14.5%)	45 (14.0%)	234 (16.8%)
Unemployed	7 (3.3%)	15 (5.7%)	12 (6.2%)	7 (3.3%)	7 (2.5%)	15 (4.7%)	63 (4.2%)
Unknown	30 (14.1%)	43 (16.3%)	28 (14.5%)	41 (19.4%)	51 (18.0%)	40 (12.5%)	233 (15.7%)

*NATA Professional Education Committee

develop professional preparation curricula to be cognizant of this, and to respond in innovative and creative ways to ensure quality care for secondary school athletes thus affected.

Most of the class of 1990 (57.9%) were not employed in athletic training (7) (Table 1). Of these, 68.8% were pursuing post-graduate study, 14.0% were employed in positions unrelated to athletic training, 4.7% were unemployed, and the positions held by the remaining 12.5% of the graduates were unknown.

The areas of study that these graduate students were pursuing were not identified in the report. It could be, therefore, that these individuals were pursuing advanced degrees in athletic training and would ultimately be teachers/athletic trainers in secondary schools. Such a suggestion, however, is speculative, particularly in light of Rankin's (11) contention that "most students going into graduate programs hope to obtain employment in a clinical setting."

The trend toward employment of athletic trainers in clinics, hospitals, and industry has been emerging for some

time. Since 1985, there has been a steady decrease (39.7% to 27%) in the number of athletic training graduates employed in the secondary school setting. During each of these intervening years, the rate of employment in clinics and other related settings exceeded the rate of employment in secondary schools, demonstrating that the private sector is providing an expanding job market for graduates of athletic training programs.

CURRICULAR IMPLICATIONS

In 1987, the NATA established the NATA Clinic/Corporate Training Committee to meet the needs of a "population of at least 1200 current members, and growing" (5). Don Wilson, of the Rehabilitation Clinic of Houston, is "currently conducting a role-delineation survey to ascertain the responsibilities of these clinic or corporate trainers" (4). Wilson (4) has stated that the survey is "intended to determine where they are, what they do, who they work for, and what their income is." Wilson (5) also has expressed the hope that his research

will result in curricula that “include more specific education to prepare students who will graduate into clinic/corporate positions.”

The June 15, 1990, NATA Placement Vacancy Notice (8) advertised 109 job opportunities for certified athletic trainers. Of those 109 vacancies, 35.7% were at the secondary level, 28.6% at the college level, and 35.7% in the private sector. These data suggest that employment in the private sector is a trend rather than a fad.

These data convinced the curriculum planners at Bowling Green State University that an innovative approach to professional preparation was essential if we were to meet the needs of a changing marketplace. We felt obliged to provide opportunities for students to acquire skills and knowledge needed in the private sector. Retaining the option for the “traditional” program, however, was also considered essential. Consequently, we developed two programs, each leading to eligibility for the NATA Certification Examination and each designed to satisfy the demands of distinctly different career goals. The “traditional” track, the Athletic Training Certification Program, leads to teaching/athletic training positions in secondary school settings. The new track prepares students for athletic training-related employment in the private sector.

The “traditional” track evolved from the Athletic Training Minor program that had been in place for many years. It consists of 50 semester credit hours covering the areas mandated for NATA approval. Students choosing this program may major in any area within the University, but they typically are education majors.

The curriculum leading to employment in the private sector, however, represents a radical departure from customary practice. This program is an emphasis within the sport management major and does not lead to a teaching certificate. Both programs provide the scientific base required for athletic training. The primary difference between them is that through the athletic training emphasis in sport management, students also acquire expertise in business-related areas necessary for successful performance in the private sector. Since sport management is a relatively new area of academic study, a brief historical overview will be provided to clarify the nature of the curriculum and how athletic training fits into its scope and purpose.

SPORT MANAGEMENT

The concept of formal academic preparation in sport management was introduced in 1957 by Walter O’Malley, owner of the Los Angeles Dodgers (2). According to Mason (2), O’Malley recommended educational programs for persons who wished to be able to: “administer a marina, race-track, ski resort, auditorium, stadium, theatre, convention or exhibition hall, a public camp complex, or fill an executive position at a team or league level in junior athletics such as Little League baseball, football, scouting, CYO, and youth activities, etc.” The first sport management professional preparation curriculum was a graduate program established at Ohio University in 1966. Since then, sport management curricula have proliferated at a rapid pace. There are currently

more than 90 undergraduate and 64 graduate programs in the United States (3). Many of these programs have incorporated exercise and sport science preparation into O’Malley’s vision of sport management, and offer programs not only for students planning to work in sporting venues, but also for students who wish to become managers in corporate fitness programs, commercial health/fitness clubs, cardiac rehabilitation clinics, and sports medicine clinics.

Bowling Green State University is one of the institutions that expanded the concept of sport management to include exercise and sport science settings. The Bowling Green undergraduate sport management curriculum was based on data collected and analyzed through a national survey of sport and fitness management practitioners (9). The task analysis associated with this research revealed that, within the broad spectrum of sport and fitness management, one set of general tasks existed and three discrete career areas could be identified (Figure 1). The curriculum committee at Bowling Green refined the information from the original research and created a curriculum model that reflected differences among tasks required of individuals in various aspects of sport and fitness management.

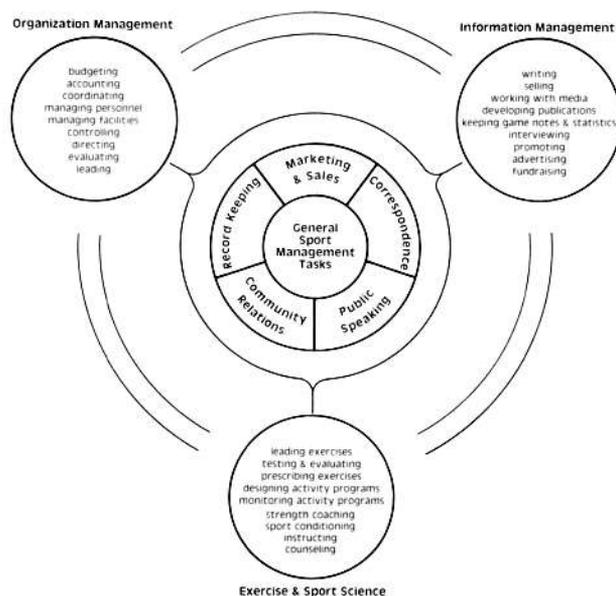


Figure 1. Sport and fitness management task clusters
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CURRICULUM

The Bowling Green undergraduate curriculum contains a general education component, a sport management “major core,” and three interest-specific options (Figure 2). Each option consists of an “option core” plus several additional required and/or elective courses that constitute career “emphases.” Option I, Exercise and Sport Science, is composed of a “sport” emphasis, a “physical fitness” emphasis, and an “athletic training” emphasis. Option II, Sport Information Management, has “sport marketing” and “sport information”

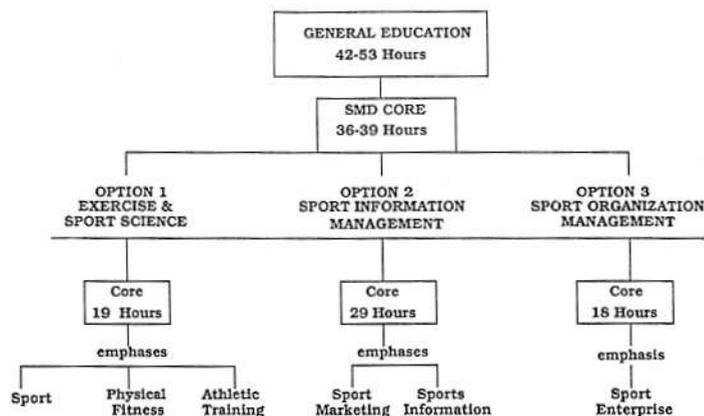


Figure 2. Bowling Green undergraduate curriculum model

identified as emphases within it. Option III is Sport Organization Management and offers an emphasis in "sport enterprise management."

The coursework required of sport management majors who emphasize athletic training within the Exercise and Sport Science option is presented in Figure 3. The curriculum is composed of a general education core, a major core, an option core, and emphasis requirements. The emphasis requirements and most of the option core courses conform to the *Guidelines for Development and Implementation of NATA Approved Undergraduate Athletic Training Education Programs* (6).

Several of the sport management core courses are not NATA subject matter requirements. These are business-related courses that prepare students to work as managers in sport or exercise settings. The professional preparation of athletic trainers, therefore, includes not only the traditional health-and-injury-related courses mandated by the NATA, but also coursework identical to that taken by prospective managers in sport settings. As a "new breed" of athletic trainers, these graduates will be providers of services and, as such, will be managers of people as well as managers of injuries. Because they will be required to supervise the environment in which sport and exercise activities occur, they must be knowledgeable about management theory and application, marketing and promotional strategies, facility planning, and the business use of microcomputers.

FIELD EXPERIENCES

Students in the sport management curriculum accumulate the 800 clock hours of clinical experience mandated by the NATA, and a minimum of 735 clock hours in sport and exercise science field experiences. These experiences may be in sports medicine clinics, industrial fitness programs, university athletic departments, professional sport, hospitals, or other settings approved by the faculty. Through these experiences, students are expected to gain additional athletic training skills associated with their emphasis, as well as management and business skills that should enable them to function as managers of health care teams, i.e., groups of individuals working in concert to manage the entire health care setting.

SMD Core	36-39 hrs.
Introduction to Sport Management	3
Computer Utilization in HPER Services	3
Principles of Sport Management	3
*Sport Facility Planning & Management	3
Practicum	3-6
Legal Aspects of Sport & Recreation	3
Internship	15
Professional Resources in Sport Management	3

Option I Core: Exercise and Sport Science 29 hrs.

Handicapped Client in Sport & Recreation	3
*Care & Prevention of Sports Injuries	3
*Foundations of Sport Psychology	3
History & Philosophy of Sport	3
*CPR & Advanced First Aid	3
*Introduction to Movement Analysis	2
*Structural Kinesiology	3
*Biomechanics	2
*Exercise Physiology	3
*Anatomy & Physiology II	4

Athletic Training Emphasis 28 hrs.

*Evaluation of Athletic Injuries	3
*Pathology of Athletic Injuries	3
*Therapeutic Athletic Exercise	3
*Therapeutic Athletic Training Modalities	3
*Athletic Conditioning	3
*Advanced Concepts in Personal & Community Health	3
*Instructors Advanced First Aid & Emergency Care	1
*Drug Use & Abuse	3
*Nutrition	3
*Principles, Ethics & Problems of Coaching	3

*Courses necessary to meet NATA subject matter requirements (7)
(Total hours for NATA subject matter requirements are 54 semester hours.)

Figure 3. Exercise and sport science option, athletic training emphasis

RECOMMENDATIONS

For many years, students desiring employment as athletic trainers have been expected to become teachers as well. Not only does this practice limit students' options, it also permits uninterested and possibly unqualified individuals to become teachers simply because that is the only route open to them. The profession of athletic training needs committed, qualified athletic trainers just as the teaching profession needs committed, qualified teachers. Therefore the following recommendations are offered for future growth of the profession: 1) curriculum planners across the nation should consider developing programs similar to the athletic training emphasis at Bowling Green; 2) planners should conduct institution-specific research to determine the placement rates of their alumni in the various settings; and 3) current students should be polled to discover whether they would be interested in working in the private sector. An alternative curriculum is not appropriate for every institution, but for those who choose to develop such a plan, it can be a challenging, creative, and rewarding experience.

THE FUTURE

Clement (1) has predicted that in the future, the concept of hospital wellness centers will expand and will include an emphasis on extensive preventive counseling. According to Snyder (12), "In the year 2000, we will be paying almost as much attention to prevention—studying and anticipating problems that could happen in order to keep them from happening—as we currently do to treatment—attending to what has already occurred." Athletic trainers have a critical role to play in these wellness centers as their expertise in prevention will be valued and their advice encouraged.

Perelman (10) has predicted that by the year 2020, traditional tax-supported schools will have been replaced by computer-based educational programs conducted in the home. This prediction suggests the demise of today's school buildings, school-based athletic programs, and the need for athletic trainers in traditional settings. According to Clement (1), however, "Although the computer may replace the school as a means to enabling students to acquire facts, the computer will not provide the opportunities for socialization and interaction that have become a hallmark of the schools." Consequently, a new type of community center will evolve which will have provisions for this socialization and interaction. An important component of these community centers will be competitive athletic contests similar to today's high school athletic programs. Well-prepared athletic trainers who possess not only the technical skill to prevent and manage injuries, but also expertise in the management of the athletic training setting in these non-school settings, will be critical in this new age.

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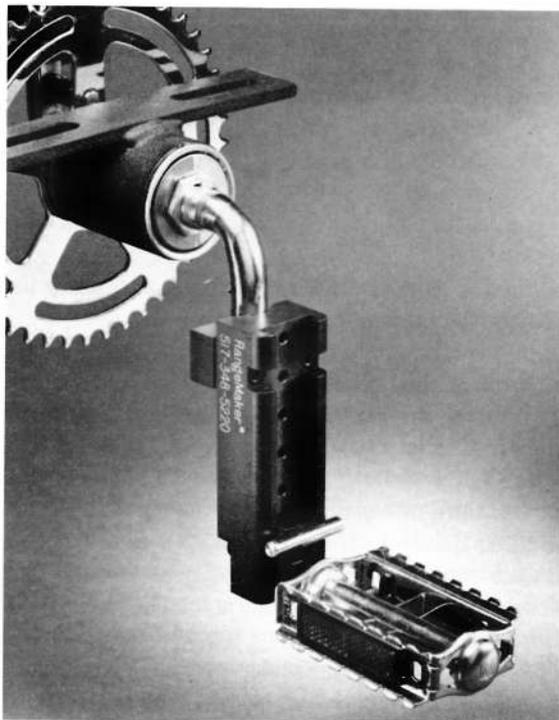
12. Titles should be brief within descriptive limits (a 16 word maximum is recommended). The name of the disability treated should be included in the title if it is the relevant factor; if the technique or type of treatment used is the principle reason for the report, it should be in the title. Often both should appear.
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14. A comprehensive abstract of 75 to 200 words must accompany all manuscripts except **tips from the field**. Number this page one, type the complete title (but not the author's name(s)) on the top, skip two lines and begin the abstract. It should be a single paragraph and succinctly summarize the major intent of the manuscript, the major points of the body, and the author's summary and/or conclusions. It is unacceptable to state in the abstract words to the effect that "the significance of the information is discussed in the article." Also, do not confuse the abstract with the introduction.
15. List three to six key words or phrases that can be used in a subject index to refer to your paper. These should be on the same page as, and following, your abstract. For tips from the field, the key words should follow immediately after the title on the first numbered page.
16. Begin the text of the manuscript with an introductory paragraph or two in which the purpose or hypothesis of the article is clearly developed and stated. It should tell why the study needed to be done or the article written, and culminate with a statement of the problem (or controversy). Highlights of the most prominent works of others as related to the subject at hand are often appropriate for the introduction, but a detailed review of the literature should be reserved for the discussion section. In this brief (1 to 2 paragraphs) review of the literature, identify and develop the magnitude and significance of the controversy. This is often done by pointing out differences between others' results, conclusions, and/or opinions. Remember, the introduction is not the place for great detail; state the facts in brief specific statements and reference them. The detail belongs in the discussion. Also, an overview of the manuscript is part of the abstract, not the introduction.
17. The body or main part of the manuscript varies according to the type of article (examples follow). Regardless of the type of article, however, the body should include a discussion section in which the importance of the material presented is discussed and related to other pertinent literature. Liberal use of headings and subheadings, charts, graphs, and figures is recommended.
 - a. The body of an **experimental report** consists of a methodology section, a presentation of the results, and a discussion of the results. The methodology section should contain sufficient detail concerning the methods, procedures, and apparatus employed so that others can reproduce the results. The results should be summarized using descriptive and inferential statistics, and a few well planned and carefully constructed illustrations.
 - b. The body of a **review of the literature** article should be organized into subsections in which related thoughts of others are presented, summarized, and referenced. Each subsection should have a heading and brief summary, possibly one sentence. Sections must be arranged so they progressively focus on the problem or question posed in the introduction.
 - c. The body of a **case study** should include the following components: personal data (age, sex, race, marital status, and occupation when relevant - but not name), chief complaint, history of present complaint (including symptoms), results of physical examination (example: "Physical findings rele-

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 - a. Knight K: Tips for scientific/medical writers. *Athletic Training, JNATA* 25: 47-50, 1990.
 - b. Day RA: *How to Write and Publish a Scientific Paper*. 3rd ed. Phoenix: Oryx Press, pp. 54-55, 1988.
 - c. Albohm M: Common injuries in women's volleyball. In Scriber K, Burke EJ (Eds): *Relevant Topics in Athletic Training*. Ithaca NY: Monument Publication, 1978, pp. 79-81.
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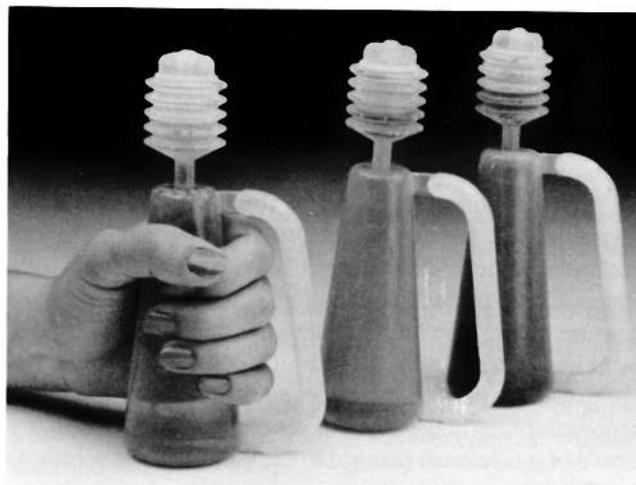
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Potpourri

Dennis Aten, MS, ATC, RPT

New Knee Cartilage?

Running & Fitnews

Kevin Stone, MD, at the Pacific Presbyterian Medical Center in San Francisco, has succeeded in regenerating cartilage in dogs' knees. A dog's knee has the same basic structure as the human knee. It is a good model for experimental studies, and it usually shows evidence of arthritic changes about six weeks after removal of the medial meniscus (one of the shock absorbing structures between the bones of the joint).

The procedure begins with a collagen template, or scaffold. Collagen is a fibrous protein found in connective tissues. Cartilage is taken from a dog's medial meniscus; then it is trimmed and put into a nutrient solution containing the collagen template. After several weeks, Stone has been able to show migration of cartilage cells into the template.

A template with freshly grown cartilage-like cells is then implanted into the dog's knee by stitching the prosthesis to remnants of the original meniscus. Within a week or two, the dog is able to run without limping, and is soon able to exercise normally. Treadmill running showed recovery of normal joint function and gait.

Tests at periods of three months to a year showed regrowth of cartilage into the seeded scaffold with no evidence of mechanical damage to the joint from the prosthesis itself.

Although studies on dogs are still underway, Stone says, "There seems to be more protection in joints in which cartilage was regenerated compared to joints in which the cartilage has been only removed."

The feasibility of regenerating cartilage has been demonstrated for dogs. Some researchers believe that before the turn of the century, cartilage can be regrown in some human joints that are seeded with tissue harvested from an uninjured part of the body.

Interview with AR & FA member Kevin Stone, MD, who recently was awarded the Albert Trillat Young Investigator's Award at the International Society of the Knee's Sixth International Congress in Rome for his work on cartilage regeneration.

Is Alcohol a Problem with Your Athletes?

Good Health Digest

Do any of your athletes have a drinking problem? If you are not sure, here are some questions about alcohol use that you should ask your athletes:

- Do you believe that you have a problem regardless of how much or how little you drink?
- Do you feel proud that you don't get hangovers, or that you are able to hold lots of liquor?
- Do you consume two or more drinks per day?
- Do you regard alcohol as a reward or as a means to relieve stress?
- Do you defend your drinking habits by attributing them to holiday or celebration festivities?
- Do you have five or more drinks on one occasion, even if you don't drink at other times?
- Do you over-emphasize the need to have a drink before attending a social event so you can be "primed" for the occasion?

"One third of our population does not drink at all, one third drinks lightly, and one third ranges between moderate to heavy, or problem drinkers," says Nada Estes, associate professor of psychosocial nursing at the University of Washington School of Nursing.

Many people who realize that they have a drinking problem can solve it themselves by monitoring their alcohol intake, according to an article in *Health Beat*.

Weight Training for Female Athletes

News Release

Weight training is beneficial to girls in athletic programs, according to Letha Y. Griffin-Hunter, MD, an Atlanta, GA, orthopedic surgeon. "At one time, people feared that girls would become 'muscle bound' if they participated in weight training programs as part of their conditioning program," she writes in *The Pediatric Athlete*, a book recently published by the American Academy of Orthopedic Surgeons.

Results show that weight-training "increases strength and does not result in large increases in muscle bulk, unless the girl is genetically pre-disposed," said Dr. Griffin-Hunter. "Weight training programs can increase a girl's strength by as much as 40 percent without increasing muscle bulk."

"Boys and girls are most equal in their athletic abilities during childhood," she said. "After puberty, males increase in height, weight, and muscle mass. Although females also increase in height and weight," Dr. Griffin-Hunter said, "there is no parallel increase in muscle mass."

In equally conditioned persons, muscle is 23 percent of a woman's body weight and 40 percent of a man's body weight. Women have 15 percent body fat, compared with 5 percent in men.

The Pediatric Athlete is an examination of scientific

issues involving children and sports participation. The book contains information contributed by specialists in orthopaedics, pediatrics, psychology, exercise physiology, physical therapy, and education.

The 266-page book was edited by J. Andy Sullivan, MD, Professor and Chief of Pediatric Orthopaedic Surgery, University of Oklahoma Health Sciences Center, Oklahoma City, OK, and William Grana, MD, Clinical Professor, Department of Orthopedic Surgery and Rehabilitation, University of Oklahoma, College of Medicine, Oklahoma City, OK

NOTE: *The Pediatric Athlete* (ISBN 0-89203-033-X), priced at \$19.00, can be obtained from the American Academy of Orthopedic Surgeons Customer Service, 222 S. Prospect Avenue, Park Ridge, IL 60068, (800) 626-6726.

AIDS Education?

Good Health Digest

Adolescents are aware and concerned about AIDS, except as it relates to their behavior. They know much about the disease and how it is transmitted, but they have not altered their sexual behavior, despite what they learned in AIDS education programs.

That's what a recent study by the University of Oklahoma and Texas Tech University discovered when 448 adolescents were sampled about AIDS education programs.

Sports Injury Guide Available

AAOS Report

As part of its statewide comprehensive injury prevention program, the Massachusetts Department of Public Health has produced a 75-page guide for sports injury prevention. The Bay State Youth Sports Guide not only covers activities in Massachusetts, but offers a comprehensive directory of national resources as well. The guide lists national sports and fitness associations, special events, related articles, journals, free safety and health booklets, audiovisual resources, and other related information.

Copies of the guide may be purchased for \$6.85 (plus \$1.75 for postage and handling) from: State Bookstore, Room 116, State House, Boston, MA 02133, (617) 727-2834.

Nutrition and Athletic Performance

Contemporary Nutrition

P.M. Kris-Etherton, PhD, RD, of Penn State University, contributed an excellent article in which she discussed various aspects of athletic nutrition and arrived at the following summarized conclusions.

- Energy, carbohydrate, and possibly protein needs are higher for athletes than for nonathletes.
- Carbohydrate supplementation during and after exercise is important for endurance athletes.
- A balanced diet, which is adequate in calories, can meet the vitamin and mineral needs of virtually all athletes.
- Athletes must be aware of maintaining an optimum hydration status.
- Intensive nutrition education efforts are needed to combat quackery and fads that are targeted to athletes.

New Booklet Highlights Dangers of Steroid Use

News Release

A new scriptographic booklet from the Channing L. Bete Company warns readers of the risks of using anabolic steroids to improve athletic performance, physique, strength, or self-image.

About Steroids gives a simplified explanation of the adverse physical and mental effects that anabolic steroids can have on users. The booklet points out that research on the long-term effects of steroids is incomplete; and it promotes healthy fitness and sports training through exercise, balanced diet, and rest.

About Steroids is written using scriptography, a specially developed blend of text and graphics designed to reach readers of all levels and backgrounds. An extensive line of titles is available from the publisher.

A minimum order of 25 booklets is required; quantity discounts are available. Booklets can be personalized at the buyer's request.

For a complimentary review copy of *About Steroids* and a catalog, please write: Sally W. Keir, Channing L. Bete Co., Inc., Dept. PR, 200 State Road, South Deerfield, MA 01373, or call toll free (800)-628-7733.

Video Review

Tom Gocke, MS, ATC

Myofascial Pain Syndrome: The Travell Trigger Point Tapes

Janet G. Travell, MD (Presenter)

Ben Daitz, MD (Writer and Producer)

Williams and Wilkins

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\$395.00/6 tape series

Myofascial Pain Syndrome was developed as a visual reference for the book titled *Myofascial Pain and Dysfunction: The Trigger Point Manuals Volumes 1&2* by Janet Travell, MD and David G. Simon, MD. Dr. Travell is well known for her comprehensive interest in the theory, research, diagnosis, and effective treatment of myofascial pain dysfunction. She offers many causes for myofascial pain, but suggests that an alteration or disruption of normal muscle chemistry can lead to the occurrence of pain. Subsequently, Dr. Travell has developed a method of diagnosis and treatment for those patients suffering from myofascial pain dysfunction.

The Travell Trigger Point Tapes are divided into six subject areas. They are:

- ***Introduction to Myofascial Pain Therapy***

- Basic concepts and definitions

- Evaluation of patients

- Mechanical perpetuating factors

- Ergonomics

- ***Myofascial Pain Syndromes of the Head, Face, Neck, and Shoulder Girdle***

- ***Myofascial Pain Syndromes of the Upper Torso and Shoulder***

- ***Myofascial Pain Syndromes of the Shoulder and Arms***

- ***Myofascial Pain Syndromes of the Low Back and Hip***

- ***Myofascial Pain Syndromes of the Hip, Thigh, and Calf***

In the first tape, Dr. Travell provides detailed demonstrations in the areas of patient evaluation, pain characteristics, muscle actions, mechanisms of injury, location of trigger points, and methods of treatment. She pays meticulous attention to the topographical anatomy of the body, and explains the importance of proper positioning for both patient comfort and to facilitate patient evaluations. Dr. Travell explains the importance of understanding the characteristics of pain and how this will assist the examiner in the treatment of myofascial pain dysfunction.

The remaining tapes concentrate on distinct body areas, specific myofascial pain dysfunctions, and proper patient positioning for spray and stretch techniques. At the conclusion of each tape, there is a comprehensive review of the information that highlights important concepts introduced by Dr. Travell.

Myofascial Pain Syndrome: The Travell Trigger Point Tapes is the only video series I have seen that addresses this subject matter. Likewise, after seeing the preview tape, I feel secure in recommending it to any athletic trainer who is interested in learning more about myofascial pain. The tape is professionally produced and covers the subject material thoroughly. The use of live model demonstrations for spray and stretch treatment techniques and the illustrated, comprehensive review concluding each section provides for an impressive program.

Myofascial Pain Syndrome: The Travell Trigger Point Tapes, coupled with the book authored by Drs. Travell and Simons, is an extensive look at myofascial pain. I am quite impressed with Dr. Travell's work and hope you will agree that this is an effective educational program.

Book Review

Phil Callicut, EdD, ATC

Safety in Ice Hockey

Editors: C.R. Castaldi and Earl F. Hoerner
American Society for Testing and Materials
1916 Race Street
Philadelphia, PA 19103
1989, ASTM Publication Code Number: 04-01050-47
ISBN: 0-8031-1274-2
284 pages, Illustrated

On October 27, 1987, a symposium entitled "Safety in Ice Hockey" was held in Montreal, Quebec, Canada. The event was co-sponsored by the Ice Hockey Subcommittee of the American Society for Testing and Materials (ASTM) and the Hockey Equipment Certification Council (HECC) of the United States. Twenty-five papers were presented representing the views of 50 leading hockey scientists, administrators, coaches, and referees from the United States, Canada, and Sweden. Each paper was peer reviewed, preceded by an abstract, and accompanied by thorough references. The 25 papers, now published in *Safety in Ice Hockey*, have been grouped into sections on Epidemiology, Rules, Officiating and Risk Factors, Body and Knee Injuries, Playing Equip-

ment, Playing Facilities, and Head and Face Equipment.

The book opens with three papers on epidemiology, the first by K.S. Clarke, a pioneer in modern sports injury epidemiology. The second, by Castaldi and associates, is a thorough review of hockey injury studies from the 1960s to the present. Based upon 13 years of data from the Amateur Hockey Association of the United States (AHAUS), a seven-year study of U.S. college hockey, and other recent short-term studies, it has been shown that hockey injuries are declining, with the exception of catastrophic upper spinal cord injuries. The prevalence of these is beginning to mimic that found in football. Studies of eye injuries by T. Pashby reveal that the use of face protectors has eliminated blinding eye injuries in youth, high school, and U.S. college players, but not in Canadian juniors, and especially not in adult Old Timers' hockey, where blinding eye injuries are increasing, because of the players' failure to use protective equipment.

Papers by M. Rudolph and R. Parayre on rules and officiating provide an excellent analysis of the relationship of these two factors to injuries. A study by the Sports Safety Board of Quebec, Canada, demonstrates that the simultaneous changing of age groups and body checking rules signifi-

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cantly increased the injury experience for adolescent age players. P. Bishop, an authority on the biomechanics of hockey injuries, reviewed his studies on spinal cord injuries and describes methods of prevention.

The subject of risk assumption is reviewed by C. Abraham, who includes information about product and opponent liability, facilities, and also spectator injuries. F. Mastrangelo describes how the athletic trainer can reduce the risk of injury. S. Walsh, coach of a Division I U.S. college team, raises the possibility that players may now be so well protected against injury that they play more aggressively, thus increasing the possibility of more serious injuries. The entire subject of face protectors and helmets is thoroughly reviewed in five papers by internationally known authors from Canada, the United States, and Sweden.

Other studies presented in the book address the topics of knee braces, hockey rink related injuries, the hockey stick, and the potential of designing hockey skate boots to facilitate the skating motion. G. Couture, a mechanical engineer and manufacturer of skate blades, provides a detailed description of the blade, including its history from the sixteenth century, and the technology of modern hockey skate blades, which may explain why some blades are more prone to breakage than others.

I consider this book an excellent guide for the athletic trainer, the medical practitioner, or the physical education student who may be involved in ice hockey. Controversial

safety issues surround hockey. This book can help a reader gain information to assist in the development of his or her own opinions of the safety issues in ice hockey. It is a must as a library reference book, especially in colleges and universities that have sports medicine, physical education, sport sciences, or athletic training curricula.

The overall tenor of the symposium was the discussion of the safety standards that are used in the sport of ice hockey. Reading these papers and learning the evolution of safety standards is truly an education. To my knowledge this is the only book of its kind regarding the sport of ice hockey.

Robert B. Burke, ATC
Hopedale, MA

EDITOR'S NOTE: I want to thank Mr. Burke for bringing this interesting text to the attention of *Athletic Training, JNATA*. As I have stated in a number of past issues, there are so many great books dealing with a wide range of topics that one individual cannot keep abreast of all of the literature being published. Our only chance to stay ahead of this power curve is for all sports medicine professionals, like Mr. Burke, to share with the entire profession. I ask anyone who reads a new and interesting book to contact me. When we have cooperation from all segments of our membership, we will continue to move forward because cooperation serves as a medium for growth.

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Current Literature

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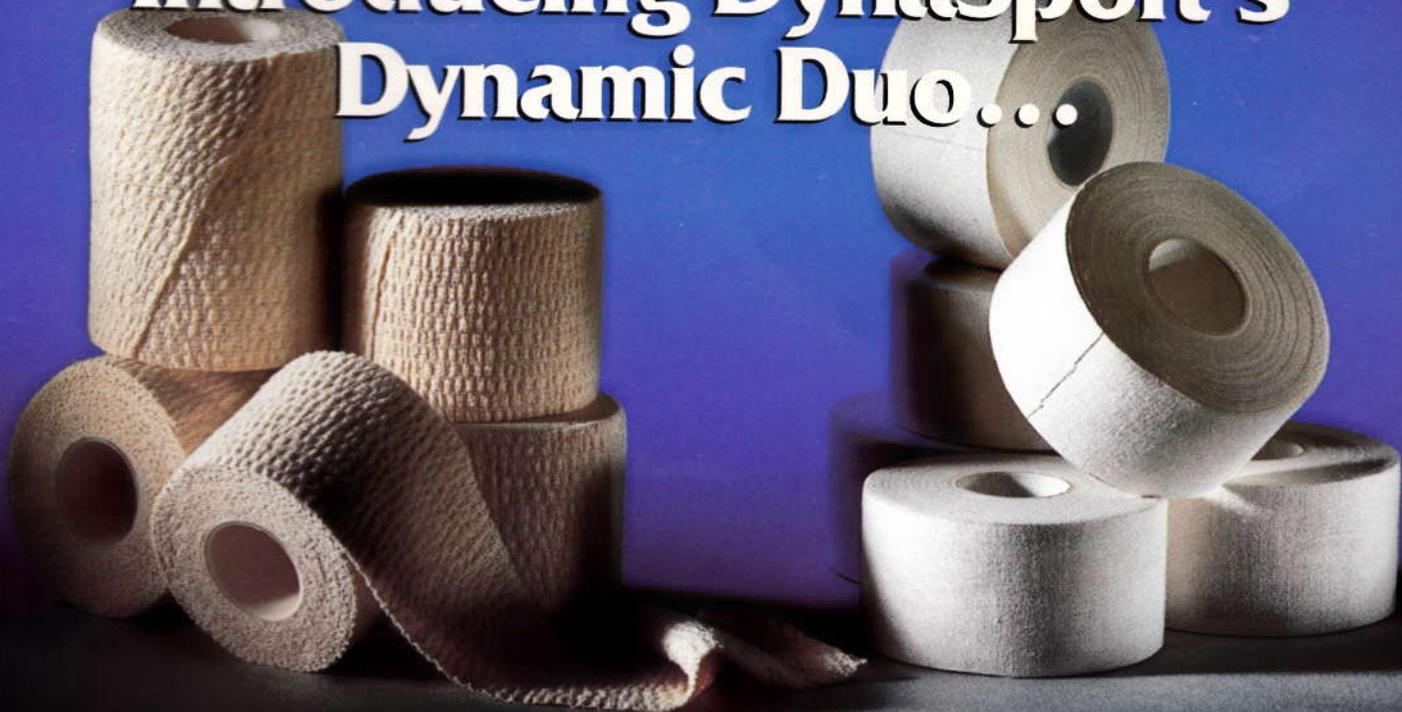


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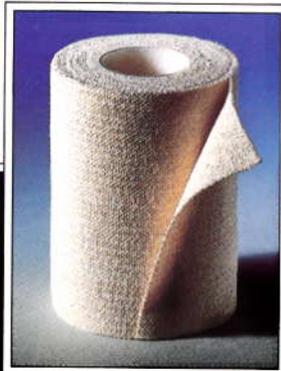
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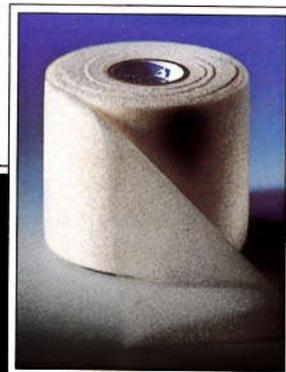
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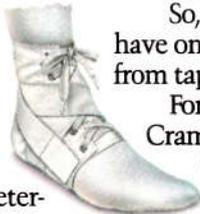
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