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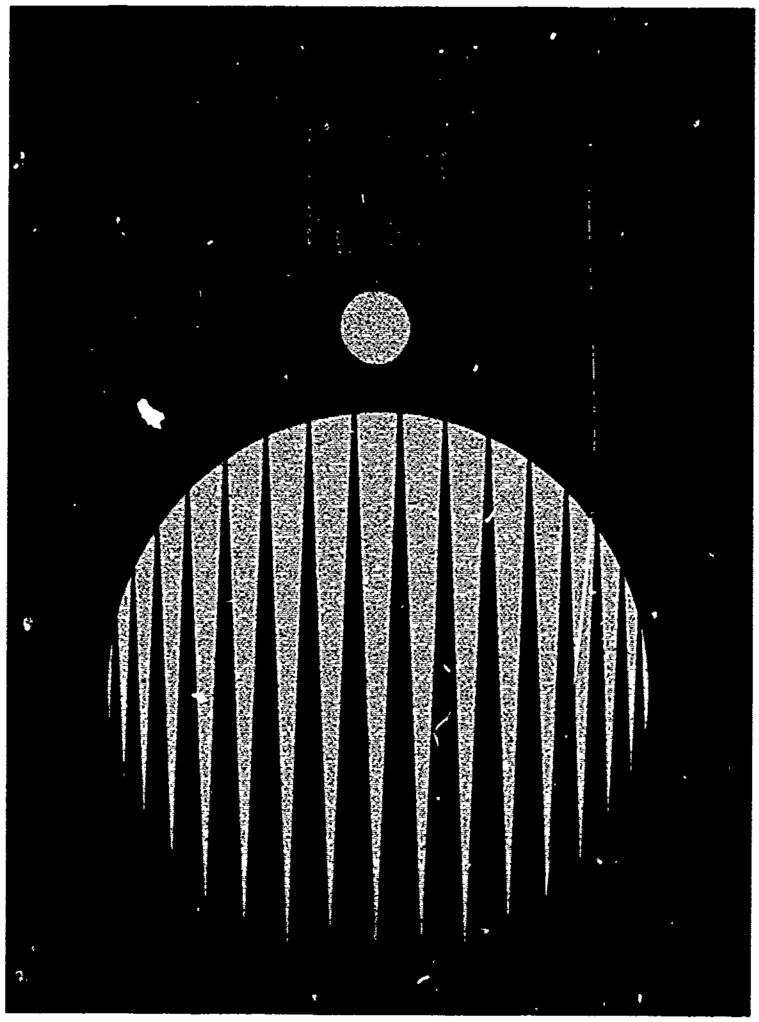
ABSTRACT

This anthology of articles concerned with injury in sports and safety procedures is divided into three parts. Part One is devoted to general discussions of safety and a guiding philosophy for accident prevention. Part Two develops articles on administration and supervision, including discussions of health examination, legal liability, facilities, equipment, and supplies. Part Three is broken down into nine sections in which individual sports and their safety problems are considered. The nine section headings are safety in team sports (baseball, basketball, soccer, others); safety in individual sports (archery, bowling, others); safety in dual sports (Fencing, judo, wrestling); safety in aquatic activities; safety in open water aquatic sports; safety in winter sports; safety in outing activities (fishing, camping, hunting and shooting); safety in dance and in children's movement (developmental and play activities). Included as appendixes are a suggested outline for a college course in sports safety and copies of questionnaires on sports safety sent out to athletic personnel. (JA)



ACCIDENT PREVENTION AND INJURY CONTROL IN PHYSICAL EDUCATION, ATHLETICS, AND RECREATION

CHARLES PETER YOST
EDITOR

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Preface

Sports have a major role in life's struggle and are real and valued experiences. Sports injuries, however, reflect an inefficient way of life, signifying human or environmental stress. Today the public is showing increased interest in sports injuries and accidents and is asking "why?" Significantly, taking needless risks in sports is questioned seriously by today's youth.

Traditionally, accidents in sports were accepted as part of the game. Newer and more sophisticated sports thinking no longer accepts that accidents are inevitable. They are caused by conditions or persons that are not right! It follows that correction and control of conditions and persons can reduce significantly sports accidents and injuries.

Desirable policies to be followed by school and college administrators of physical education, athletics, and sports programs were specified in *School Safety Policies — with Emphasis on Physical Education, Athletics, and Recreation*, published by the American Association for Health, Physical Education, and Recreation (AAHPER) in 1968. Translating these policies for a sound injury prevention and accident control program is the primary purpose of this publication, *Sports Safety*.

AAHPER and the United States Public Health Service (USPHS) strongly urge that all specialists entering the sports field should be knowledgeable about the extent and causes of injuries in various sports and general prevention controls. They also should know about injuries unique to various sports and control techniques. As an essential beginning, this text examines the basis for leadership preparation in injury prevention.

The injury prevention and hazards control knowledge of sports leaders can have a great influence on the safety of participants. AAHPER and the USPHS recognize that a comprehensive guide on this subject is necessary for college, school, anu community sports departments for their use in preprofessional and in-service training programs. Chapters dealing with specific sports and activities are valuable as a reference for volunteer leaders associated with youth and adult sports programs as well as for participants. This publication includes principles and practices in sports injury prevention which school administrators, physical education teachers, athletic coaches, and those responsible for community sports programs may use in improving sports programs.

Part I of this publication (chapters 1 and 2) deals with the accident problem and the philosophy of accident prevention and injury control in sports. Part II (chapters 3-11) deals with general administrative policies and procedures in terms of *external controls* and *internal controls:* external controls refers to rules and regulations *imposed* by a group other than the sports participants' sponsoring institution or organization; internal controls refers to those administrative and supervisory practices which are *within* the sponsoring institution or organization. Part III (chapters 12-55) deals with safety in specific sports or activities. College and university personnel desiring to incorporate a sports safety course in their curricula will find helpful a "Suggested Course Outline for A College Course in Sports Safety" in Appendix A.

Many people have assisted in the preparation of this text. Experts in the field of sports have explored significant factors and principles of injury control. A decade ago, the leaders in the field recognized the need for this type of publication. Many of these leaders were instrumental in establishing the Safety Education Division of AAHPER and were joined by related agencies including the USPHS, represented by Daniel P. Webster, whose efforts in concert with the Safety Education Division and USPHS resulted in a contract negotiation for the development of *Sports Safety*.

Indebtedness is expressed to the authors and co-authors who are identified in the Table of Contents. Certain editorial adjustments were made in the manuscripts to avoid duplication of material, to assure continuity of content, and to conserve space. Collaborators and reviewers who contributed valuable assistance are acknowledged at the end of various chapters.

Particular thanks is expressed to Bernard I. Loft for his leadership as textbook project director and to Kenneth S. Clarke, J. Duke Elkow, A. E. Florio, and Daniel P. Webster for their teamwork in assembling information and their contributions as members of the editorial committee; to Edward Mileff who served as liaison between AAHPER and USPHS; to John H. Cooper who succeeded Edward Mileff; and to John L. Morgan, the project officer for USPHS for his wise counsel. Contributions of time and energy devoted to secretarial excellence were made by Mrs. Lilley Geelen Cale, Miss Joyce Arthur, and Mrs. Helen Waters. Special acknowledgment is given to Mrs. Charles Peter Yost for her assistance in cataloging materials and in preparing the final manuscript.

To have served as editor of this publication, a role assigned to this writer by the editorial committee, has proved to be a rich and rewarding experience. Sincere appreciation is expressed to the committee for its confidence. On behalf of the committee, this writer states that *Sports Safety* will meet a long felt need for a text to be used by the profession to achieve further reductions in accidents and injuries in sports.

Charles Peter Yost
Editor

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THE PROBLEM, THE PHILOSOPHY

PART I

The Injury Problem in Sports | J. DUKE ELKOW, Ph.D.

1

Modern technology and scientific understanding of human tolerances have enabled man to walk on the moon. In space vehicles, both equipment and the possibility of human failure are controlled through advanced systems safety techniques. On earth, however, where work and play are normal activities for most people, there is less control of hazards. Daily activities that supplement work, such as play and recreation, meet deep-seated psychological demands. In work and play unexpected accidents occur repeatedly unless appropriate controls are exercised. If man is to achieve success in work and in play and experience great adventures in life he must learn to curb accidents and injuries that rob him of his goals. He must learn to identify risks that are reasonable and unreasonable.

Many persons who engage in physical activities do so neither well nor wisely. To enjoy physical activities one has to be free from injury and illness. Yet disabilities in sports stem primarily from accidental causes. The athlete who spends months or years in strenuous conditioning programs may lose in a matter of seconds the results of that effort through a sports injury. An injury to a key member of a team may destroy a chance for victory. Hazards to players must be controlled if man is to achieve greater success in sports.

In recent years the enormous growth of readily available sports equipment and facilities and the increased number of participants have far outstripped the controls designed to make play safe yet enjoyable and health promoting. The resultant injuries often handicap youth and adults. When these injuries are measured in days and years of lost time and loss of human productivity it is evident that sports accidents are a major safety problem.

Until recently, most reports on recreational sports lacked reliable injury data. Since most participation has been on an individual and unorganized basis, there generally has been no central reporting of accidents. Even in controlled situations such as organized athletics and physical education activities, completion and analysis of accident and medical reports have been resisted by both participants and sports leaders. The scarcity of information on the extent and circumstances of injuries in athletics accounts for the frequent citing of outdated studies.

Although still in the early stages of development, an increasing number of youth organizations is routinely reporting accidental injuries. Significantly, the practice of analyzing such reports contributes to the taking of injury prevention measures. Similarly, the annual report of the Committee on Injuries and Fatalities of the American Football Coaches Association has contributed its efforts to provide protective headgear and other equipment.

Facts on accidents and injuries in the use of firearms, snow skiing, boating, scuba diving, and baseball prepared by organizations such as the National Rifle Association, National Ski Patrol System, United States Coast Guard, Underwater Society of America, and Little League help to control the hazards of these sports. Studies conducted by the American Red Cross on the circumstances surrounding drownings and near drownings have provided information on factors which contribute to water injuries and fatalities.

Major breakthroughs in the scientific analysis and interpretation of the causes of sports injuries are anticipated as the result of studies by individual physicians and teams composed of physicians, trainers, coaches, and athletic directors. Much of this valuable medical research has been conducted by the American Medical Association Committee on the Medical Aspects of Sports and similar groups involved in accident studies. The Committee published *Standard Nomenclature of Athletic Injuries*[1] which, if used effectively, will allow for the maintenance of meaningful records and statistics concerning sports injuries, their causes, and their prevention.

ACCIDENTS AND INJURIES DEFINED

Accident

The problem of accidental injury control is complicated by the many definitions of *accident*. Most individuals accept the dictionary definition of accident, i.e., an event that takes place without one's foresight or expectation especially one of an afflictive or unfortunate character. In the sports safety field an accident is an unplanned event capable of resulting in loss of time, property damage, injury, disablement, or even death. Other definitions state that accidents are the occurrence of unexpected physical or chemical damage to living or nonliving structures or that an accident is a chain of events and circumstances leading to unintended injury. To complicate matters further, the term accident is defined by every agency that accumulates such data for measurement purposes. For example, the United States Coast Guard regards a reportable accident as one in which a person has lost his life or has been incapacitated for at least 72 hours by injuries and/or the craft has sustained property damage in excess of $100.

From a behavioral scientist's approach, accidents may be regarded as injury producing behavior with the major characteristics being the degree of expectedness, of avoidability, and of intention. There is concern over such corollaries as degree of warning, misjudgment, negligence, or duration of the accident. Some researchers question whether injuries or damages should be included in a definition of accident since a resulting injury is the outcome of an unexpected event and does not in itself constitute the accident. Why an individual is injured is a separate question from why he was involved in an accident.

The extent to which society views an event as serious and unexpected determines whether it will call that event an accident. What one group calls an accident may not be regarded as such by another group. Sports fans may refer to an event as an accident while a player or coach may consider it an injury. Identifying an event as an accident is predicated upon the causal factors in that setting, the possibilities of prevention or control, and the seriousness of the harm. (*Accident Facts* uses deaths and injuries as indices in recording accident information.)

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[1] American Medical Association. *Standard Nomenclature of Athletic Injuries* (Chicago: The Association, 1966).

Injury

An injury is a damage or hurt done or suffered — a detriment to or violation of person, character, feelings, rights, property, interests, or value of a thing. Two types of injuries are especially used in the safety field — restricted activity injuries and bed disabling injuries.

The National Health Survey conducted by the United States Public Health Service reports that 50 million people are injured each year. Half of these injuries require only brief medical attention and there is no restriction of the person's usual activity. One injury in five confines a person to bed. According to the National Health Survey, a *bed disabling injury* is one which confines a person to bed for more than half of the daylight hours on the day of the accident or on a following day. The National Safety Council defines a disabling injury as an injury which prevents a person from performing his usual activities for a full day beyond the day of the accident. The Council reports that nearly 11 million disabling injuries occur annually. A *restricted activity injury* is one which causes a person to limit his usual activities for a whole day.[2]

In the near future it seems likely that sports injuries will be more accurately defined as to the quantitative and qualitative limits of damage to person and/or property. From time to time researchers may want to conduct, over a limited span of time, studies of all accidents and near-accidents within a sports activity to determine where a system may be breaking down and then attempt to initiate controls which would benefit coaches and players.

The public is currently demanding improved product reliability to increase safety in the air, in automobiles, and at work. Should the public make similar demands for greater safety in sports, professionals in the sports safety field must be prepared.

INHERENT RISKS OF ACTIVITIES

In the simplest acts of daily life a certain amount of risk exists, but many of the chances people take are absolutely unnecessary. In the developing science of safety, referred to variously as "hazards control," "injury control," and "accident prevention," it becomes important to identify risks that man faces which are caused by the kinds of activities in which he may engage. When risks have been identified, methods need to be developed and evaluated which enable controls to be established on behavior and environment in the presence of danger. Not all men assess danger similarly. Even when a hazard exists some will avoid it; some will deliberately risk it; and some will avoid it on one occasion and risk it on another occasion.

In sports, participants seek exciting, vigorous, challenging, and emotionally satisfying activities. The fun of sport and the joy of the game are factors sought eagerly by players. To them the question of risk is of secondary importance. Many athletes minimize the probability of danger. They accept the demands of vigorous contact sports and expect a number of hard blows in achieving optimal physical performance. Some seek the fun of sports even though they are physically and emotionally unprepared for it. To do so increases the likelihood of injury.

Activities

Athletic activities are generally categorized as contact or noncontact sports. Other terms which are used are team sports, dual or individual sports, and combative or noncombative sports. Injuries sustained in contact sports are generally considered to be the result of stress, competition, and collisions that are an expected part of the game and not of accidental origin. In combatives or dual and individual sports the player who is

[2] National Safety Council, *Accident Facts* (Chicago: The Council, 1969).

injured may contend an accident caused his impairment or he may admit that he exceeded his performance capabilities.

When the hazards of an activity are known, coped with, reduced in intensity, or eliminated, the probability of injury is curtailed. Therefore players must understand the nature of hazard controls. This responsibility rests fully on sports administrators. Whereas the neophyte needs effective instruction to develop an awareness of potential hazards, experienced players need continued excellent coaching, strong drives for maintaining and increasing skilled performance, and a community that does not make unreasonable demands of its athletes.

It is apparent that risks are exceedingly hard to quantify. Data to assess risks are extremely lacking. A basic philosophy of safety in sports has not as yet spread in our society. With a wider acceptance of sports safety concepts, information will become increasingly available on risks in sports.

Risks

An athlete runs a 50-50 chance of receiving an injury.[3] About 90% of all sports related injuries are contusions and minor muscle pulls. The majority of these injuries may not be of accidental origin but an inherent part of the sport. The remaining 10% are more serious. They require appropriate therapeutic measures and should be assessed as to their accidental or nonaccidental nature and measures for prevention or control must be initiated when feasible.

About 20% of the one million youngsters who play football sustain an injury to knee, shoulder, or ankle each year.[4] Fifty thousand nonprofessional players require surgery on the knee. There are also frequent microtraumatic lesions that become apparent in later life and cause arthritic type impairments. About 25 to 30 persons die of football related impairments annually. This fatality rate affects one out of every 25,000 varsity players, or one per three million man hours of exposure. What does society trade off for these injuries and deaths?

Of course, hazards exist in activities other than sports. It is estimated that 10 times the number of persons die of automotive accidents for an equal period of exposure as those who succumb to football injuries. Home accidents to youth take more lives than sports activities for similar exposure periods. Drug abuse registers a very high rate of impairments and deaths.

One of the few studies on risks in sports was completed by Kenneth S. Clarke and is entitled "Calculated Risks of Sports Fatalities."[5] In it, comparisons are made of the hazards of football, power boating, auto and horse racing, and activities included in daily living. Football has the lowest death rate of all the activities investigated. Clarke contends, "What constitutes undue risk from participation in sports remains intuitive" and "... the more a sound research design is incorporated into a sports program, the more the undue-risk question can be put on an individual basis." An assessment of risks must include not only fatality and injury rates but also reports on pathological studies of individuals who have evidence of microtraumatic lesions from sports participation that become apparent and debilitating in later life.

Certain risks taken by players become evident only after careful medical study of the adverse results of sports activity. A boxer who had demonstrated superior ability nonetheless died from the first blow to strike his head. A basketball player who bumped his head against the chest of an opponent also died because he, too, had a very thin skull. These are examples of anomalies that are determined after injury and can seldom be detected prior to participation in a vigorous sport. What is needed is to determine which recurrent conditions can be detected prior to serious injury and to exercise appropriate measures to protect athletes from harm.

[3] D. C. Seaton et al., *Administration and Supervision of Safety Education* (New York: The Macmillan Co., 1969), p. 228.

[4] Rehabilitating the injured knee, ankle or shoulder, *Patient Care* 2 (Dec. 1968), no. 2, p. 68.

[5] Kenneth S. Clarke, Calculated risk of sports fatalities, *Journal of the American Medical Association* 197 (Sept. 12, 1966), pp. 894-96.

The dangers of swimming are well known. About 7,000 persons drown each year. Many are saved from drowning through effective community safety programs. The risks of drowning are greatest to young males who are overconfident of their swimming ability and stamina. In a five state study over a 12 month period 1,201 people drowned; of these, 85% were males. Significantly the water was very cold in one-third of the drownings where the water temperature was known. Of the fatalities in which the victims' swimming ability was known nearly one-half were classed as good or average swimmers. Of the total, 293 drowned while swimming, 132 while playing in the water, 105 while power boating, and 79 while fishing.[6] Water sports are the most dangerous to persons insured by the Metropolitan Life Insurance Company, with boating and fishing ranking next.

As data accumulates on how and why persons drown, newer controls will be introduced. One in 50,000 persons drown annually in the United States. It is noted that over 750,000 swimming pools are now in use. Of that number 640,000 are home swimming pools where limited control is exercised. An enormous increase is anticipated in the construction of indoor and outdoor home pools in the near future and an increase in drownings is expected unless man learns to cope with the hazards such pools introduce. To curb deaths and injuries in aquatic sports requires many environmental and human controls which reflect a full understanding of the dangers.

NATIONAL DATA AND PUBLIC INVOLVEMENT IN ACCIDENTS

Recreation and sports provide the American people with increasing opportunities for adventure, excitement, status, and enjoyment. Over 90% of Americans engage in at least one of more than 75 outdoor athletic and recreational sports activities. The current participation explosion in recreational sports is unprecedented. The mushrooming population has more time and money to spend in the rapidly expanding world of sports recreation.

In 1800, the workweek was 84 hours. In 1910, it was about 52 hours, in 1960 it was 40 hours, and in the 1970s it may well average 32 hours or less, with a four day workweek. In the next quarter of a century Americans will have a total of 660 billion hours of leisure time more than they had a quarter of a century ago.

We are an active nation. Of the 200 million people in the United States over 110 million swim annually. Fifty million use boats, 40 million fish, and the same number use fire weapons with 20 million of them hunting annually. About 30 million persons camp each year, 35 million bowl, 4 million ski, 15 million water ski, and 3 million fish through the ice in 10 states.

It is estimated that over 25 billion dollars are spent annually on recreational sports. This sum exceeds the costs of all accidents in one year which was 23 billion dollars. Public accidents alone cost Americans 1.3 billion dollars annually. It is difficult to estimate how costly sports accidents are to our people in terms of injuries and damage to equipment.

An interesting study by LaCava records the frequency of sports injuries to four million Italian athletes during an eight year period. The accident frequency of the 17 sports studied are listed in descending order: rugby, wrestling, weightlifting, football (European style), boxing, cycling, roller skating, baseball, riding, gymnastics, swimming and water polo, skiing, basketball, fencing, volleyball, rowing, and tennis.[7]

[6] Medical news, *Health News* 46 (Aug. 1969), no. 8, p. ii.

[7] G. LaCava, The prevention of accidents caused by sports, *Journal of Sports Medicine and Physical Fitness* 4 (1964), pp. 221-28.

Although millions of people engage in sports annually, only a few athletes are fatally injured. In New York City, 104 persons died of sports injuries during 32 years, that is, an average of slightly more than three deaths annually.[8] Few sports page readers realize that a sports death may be caused by factors totally unrelated to athletes. Nearly 20% of all deaths of athletes are caused by heatstroke.[9]

According to the National Ski Patrol, 100,000 injuries occur to four million skiers each season. A sprain or fracture of the ankle is the greatest hazard in skiing, especially for beginners. About 25% of all ski injuries occur to the knee.

The following national agencies are now active in collecting sports injury data: American Camping Association, Little League Baseball, Inc., Boy Scouts of America, National Ski Patrol System, National Federation of State High School Athletic Associations, and the National Collegiate Athletic Association. Until recently, *Accident Facts*, an annual publication of the National Safety Council, reported school sports accidents within their listing of all school and nonschool jurisdictional accidents. Now annual issues abstract information on significant sports injury experiences within cities, states, or other local community areas.

In recent years, the Safety Education Division of the American Association for Health, Physical Education, and Recreation has repeatedly recommended that a national clearinghouse on sports injury information, sports accidents, and sports research be created to gather vital information not effectively assembled by other agencies. In time, and with adequate support, such a clearinghouse may be established. This would do much to reduce sports injuries.

SCHOOL AND COLLEGE ACCIDENTS AND INJURIES

Information on the number of participants in secondary school sports is available from the Sports Participation Survey of the National Federation of State High School Athletic Associations (see Table 1). Some ratios of injuries and accidents to the total number of participants have been developing in various sports. Current studies listed sports as having a high, middle, or low hazard rate. With improved research designs, future researchers will be able to identify more clearly than now which sports have a high incidence of danger and which do not. Even within a sport it will be possible to determine which activity is more hazardous than others, such as an offensive or defensive position in football, and how the hazard may relate to equipment used or not used.

Sports related accidents in the secondary schools of New York State which were studied by Pechar fell into two categories: *personal factors* (i.e., physical and mental-emotional factors) and *administrative factors*.[10] Pechar states that 62% of the accidents were caused by personal factors and 38% by administrative factors. Physical factors included fatigue and muscular weakness. Mental-emotional factors causing accidents were ranked in this order: disregarding instructions, taking unnecessary chances, and acting before thinking.

In the 96 schools elected for this study, 1,408 accidents occurred to students in a one year period. The ranking order of sports accidents in the study are given in Table 2. Most of the accidents occurred in October and September; the fewest happened in June. Most occurred on the athletic field with the gymnasium ranking second. Sprains were the most frequent injury with the leg and foot most often impaired.

[8] Oliver E. Byrd, *Health* (Philadelphia: W. B. Saunders Co., 1966), p. 69.
[9] *Ibid.*

[10] Stanley F. Pechar, A study of the nature, frequency and related personal and administrative factors of physical education accidents among boys in the junior and senior high schools of New York State, Ed.D. dissertation (New York University, 1961).

TABLE 1

1969 SPORTS PARTICIPATION SURVEY

	NUMBER OF SCHOOLS	NUMBER OF PARTICIPANTS
Badminton	965	11,609
Baseball	13,002	360,157
Basketball	20,227	676,559
Bowling	591	8,974
Cross-Country	7,818	144,488
Curling	711	5,314
Decathlon	48	102
Fencing	42	666
Field Hockey	103	1,850
Football — 11 Man	13,959	853,537
8 Man	657	14,593
6 Man	110	1,950
9 Man	113	2,749
12 Man	768	29,601
Golf	8,650	93,841
Gymnastics	1,842	34,172
Ice Hockey	681	17,650
Lacrosse	123	2,736
Pentathlon	43	250
Riflery	305	4,279
Rowing	24	403
Rugby	22	465
Rugger	16	263
Skiing	461	8,430
Soccer	2,217	49,593
Softball	164	3,300
Swimming	3,229	83,286
Tennis	6,221	83,717
Track and Field (Indoor)	1,918	42,998
Track and Field (Outdoor)	16,836	623,139
Volleyball	3,519	63,144
Waterpolo	152	5,854
Wrestling	6,870	226,681

SOURCE: National Federation of State High School Athletic Association, 1969.

A study of accidents in 207 public junior high schools by Dissinger reveals that three-fifths of the 1,626 accidents occurred in physical education or closely related activities.[11] Boys were involved in accidents in basketball, football, softball, and baseball. Girls met with accidents primarily in basketball, volleyball, and stunts and tumbling. Accidents in the physical education classroom had a lower severity index than those in interscholastic practice, interschool games, and intramurals. The most severe injuries occurred in wrestling, football, and track. Immediate causes of injury were falling and striking or being struck by play equipment or another player.

Junior high school football produced one injury for every 10 participants in one season at a school in Ft. Lauderdale, Florida. Among the 1,194 players, the following injuries were recorded: bruises, 38%; sprains, 33%; fractures, 13%; abrasions and lacerations each 7%; and dislocations, 2%. Two-thirds of the injuries were sustained at practice, the rest during games.[12]

College accidents

A study conducted by the American College Health Association on 22 college and university campuses showed that 207,000 full-time students reported 14,487 injuries of which 1,247 were disabling. Victims of nearly three-fourths of the injuries were males, although they comprised less than two-thirds of the enrollment. One out of eight males and one out of 12 females were injured. Eight per cent of the injuries were disabling beyond the day of the accident. Distribution of on-campus accidents was 52% in athletics and recreation, 20% in school buildings, 11% on school grounds, and 2% caused by motor vehicle misuse. Off-campus accidents occurred in recreation 31% of the time, in residence 31%, with motor vehicles 25%, at work 4%, and in other areas 11%.[13]

In a study on college physical education accidents Florio found that nearly 60% of the injuries occurred in the gymnasium and not on outdoor facilities. He recorded that the most hazardous sports were touch football, ice skating, and personal defense. The highest accident rate occurred in team and contact sports.[14]

[11] J. K. Dissinger, Accidents in junior high school physical education programs, *Research Quarterly* 37 (Dec. 1966), p. 495.

[12] National Safety Council, *Accident Facts* (Chicago: The Council, 1968).

[13] *Ibid.*

[14] Byrd, *op. cit.*, p. 67.

TABLE 2

RANK ORDER OF SPORTS ACCIDENTS

Activity	Number of accidents	Incidence per 1,000 exposure	Days lost: gross	Severity: days lost per 1,000
Football	1	2	1	2
Basketball	2	7.5	2	7
Wrestling	3	5	5	6
Soccer	4	6	4	5
Track and field	5	10	7	11
Heavy apparatus	6	14	3	9
Baseball	7	7.5	8	10
Touch-flag football	8	9	6	8
Lacrosse	9	4	10	4
Softball	10	12.5	12	14
Volleyball	11	11	11	13
Games and relays	12	18	9	17
Tumbling	13	16	13	15
Swimming and diving	14.5	15	16	16
Ice hockey	14.5	3	15	3
Six-man football	18	1	14	1
Badminton	22	12.5	18	12
Tennis	22	17	19	18
Calisthenics	22	19	17	19

SOURCE: Pechar study cited in H. J. Stack and J. Duke Elkow, Education for Safe Living, *4th ed. (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966), p. 111.*

In Thorndike's 20 year study of sport injuries at Harvard University injuries were ranged as shown in Table 3:

TABLE 3

Rank	Injury	Totals
1.	Sprain	1,612
2.	Muscle contusion	1,016
3.	Strain	885
4.	Fracture, dislocation	738
5.	Simple contusion	570
6.	Inflammation and infection	546
7.	Miscellaneous	512
8.	Joint contusion	430
9.	Laceration and abrasion	415
10.	Internal injury	366
	TOTAL	7,090

SOURCE: A. E. Florio and George Stafford, Safety Education, *3d ed. (New York: McGraw-Hill Book Co., 1969).*

Each injury must be adequately treated by a physician and effective controls developed to prevent recurrence. Most injuries in sports are not serious and heal rapidly with proper care.

NEED FOR LOCAL REPORTING AND ANALYSIS

National data on sports accidents are now being collected by various agencies whose reports provide information on trends associated with sports hazards. Contributing also to the national data on sports accidents are the many local organizations with their recurrent accident experience. Local agencies within schools and colleges usually contribute information to the state and national agencies mentioned on page 8. However, national sports accident information may not meet the needs of local agencies seeking to control hazards that are unique to their communities. In our 50 states, there are environmental conditions which differ widely and many other physical factors that alter human performance and may contribute to accidents.

The emotional or psychological climate may also alter the accidents occurring to sports participants. Some communities are very sports minded and make unusual demands on players and coaches. The violence that erupts at some international soccer contests is legendary and regrettable. Other communities that may not care to support sports programs adequately are acting detrimentally to the players. Some communities seek to jettison sports contests and recreational programs because of illogically assessed injuries, rivalries, responsibilities, or other problems that arise in lieu of finding a satisfactory solution that retains the values of sports.

Two national conferences on accident prevention in physical education, athletics, and recreation have been held in recent years. The recommendations of the safety specialists who participated in the conferences are contained in *School Safety Policies with Emphasis on Physical Education, Athletics, and Recreation.*[15] In-

[15] American Association for Health, Physical Education, and Recreation, *School Safety Policies with Emphasis on Physical Education, Athletics, and Recreation* (Washington, D.C.: The Association, 1968), pp. 27-28.

cluded in one section are recommendations on the reporting and investigating of hazards and accidents in sports. While the recommendations are primarily for school personnel, they are also useful to other agencies. The theme of the publication might be summarized as follows: To reduce sports accidents and prevent their recurrence, they must be investigated, causes determined, and corrective action taken. This course necessitates effective reporting and investigation of all accidents to provide information for administrative guidance, program development and evaluation, legal analysis, and equipment improvement. To assure adequate reporting and investigating of accidents, policies must be established by school boards and nonschool agencies functioning in the sports and sports recreation field.

In any school system, sports facility, or community sports agency, a person should be designated as safety coordinator or supervisor. His primary responsibility should be to provide adequate sports accident reports, analyze them, and provide a followup account which includes accident preventive measures. Not designating someone responsible for safety reporting should reflect unfavorably on any agency. Safety is too important to dismiss lightly. Greater safety can be achieved if people want it and are ready to provide the means to secure it.

References

American Association for Health, Physical Education, and Recreation. *Annual Safety Education Review.* Washington, D.C.: The Association. Annual.

———. *Desirable Athletic Competition for Children of Elementary School Age.* Washington, D.C.: The Association, 1968.

American Medical Association. *Standard Nomenclature of Athletic Injuries.* Chicago: The Association, 1966.

Florio, A. E. and Stafford, G. T. *Safety Education.* 3d ed. New York: McGraw-Hill Book Co., 1969. 459 pp.

National Safety Council. *Accident Facts.* Chicago: The Council. Annual.

Seaton, Don Cash; Stack, Herbert J., and Loft, Bernard I. *Administration and Supervision of Safety Education.* New York: The Macmillan Co., 1969. 368 pp.

Stack, H. J. and Elkow, J. Duke. *Education for Safe Living.* 4th ed. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966. 374 pp.

Strasser, Marland K.; Aaron, James E.; Bohn, Ralph C.: and Eales, John R. *Fundamentals of Safety Education.* New York: The Macmillan Co., 1964.

Philosophy of Sports Accident Prevention and Injury Control | J. DUKE ELKOW, Ph.D.

2

During the last 25 years, safety professionals have been questioning sports leaders about controls being used to reduce hazards in sports. Some of the safety leaders were formerly active in sports athletics, physical education, and recreational sports; others were trained researchers. They had noted that reliable information on sports injury and accident control was very limited. Hazardous conditions in sports often were not clearly understood by players and coaches. Human and environmental factors contributing to the disablement of athletes which appeared infrequently or were of a subtle nature were neither observed nor analyzed. Generally, the cause and effect of hazardous conditions were reported and examined only when serious accidental injuries occurred. Such examinations often lacked effective measurement and were characterized by subjective judgment and specious reasoning. Less frequent injury producing conditions were unrecorded and unanalyzed and were discussed lightly in terms of luck, chance, or the breaks of the game.

The pervading philosophy of mid-twentieth century was that sports contained significant risks and players took their chances with such risks. The laws of many states denied justifiable redress when injuries occurred in sports, regardless of the capabilities of an administrator, coach, or teacher; the condition of the playing field; the equipment used; or the instruction provided to participants. Fortunately, the concept of legal liability is changing significantly and rapidly. Recent decisions tend to hold the supervisor, coach, or teacher liable for negligent performance even in the sports field where, in the past, risk of injury was accepted and redress seldom supported. It has now become a moral as well as a legal obligation for sports teachers to develop competencies in new areas of responsibility so that youth will attain the benefits of sports and be kept free from harm.

Individual responsibility

The development of a philosophy of safety in sports is essential if reductions in sports injury and frequency are to come about. The individuals who should be primarily concerned are the participants in sports and recreational sports activities, their coaches and teachers, the administrators of the varied sports programs, those who design and sell equipment and facilities, spectators (comprising family and friends), and others who enjoy sporting events. Physicians who pronounce individuals fit for vigorous activities and those who assist in injury treatment should also be included.

Sportsman. The sports participant may ask: What are the joys this activity holds for me? What are the chances of injury? Does the sport have a degree of danger that is a challenge for me? Can I overcome the risks? At what point do I decide to find an alternate activity? Seldom does he ask if disablement might result. Joy, fun, organic growth, adventure, and self-testing are the results the player seeks. Rarely does he believe that a capable performer will become the victim of a disabling mishap. If injury occurs he may state that it was preordained. Seldom will he admit that ineptness or some other personal factor was the cause of the injury.

Coach and mentor. The coach may ask: What are my responsibilities to my players, my institution, and the community? Am I in this job for love, money, recognition? Must I always win? What are the trade-offs? What are the anomalies that subject some participants to unsafe risks? Do I know them well? Do I protect players from their own inherent weaknesses? Have I been fully prepared for this professional role? If someone is hurt will it be my fault? Where can fault be placed? Must the fault be placed?

Parents. The parents may well ask: Is this the sport for my youngster? What will it do for him? Is it safe or unsafe? Is there another way of achieving the same goal? Parents in our society realize that sports and vigorous recreational sports activities contribute to a youngster's growth and development. However, at times they read news items that highlight danger or inordinate risks. In haste they wish to ban participation in a sport. They often do not consider how the sport can be made safe or how injury can be controlled by effective instruction, good administrative controls, and appropriate participant behavior. What choice exists for the youth who might drive a sports car instead of playing football, experiment with drugs in lieu of finding his potential in sports or academic contests, or seek escapism in place of reality?

Administrators. The administrator may ask: How does this activity contribute to the growth and development of the participants for whom I have a major professional responsibility? Has this community provided adequate support for the activities in our program? If funds are lacking what priorities do I set for the community? Do we have an effective staff to provide good leadership? Will I provide the leadership to place sports in their proper perspective in my community? Do I accept the thesis that sports injuries can be minimized by good administrative controls?

The general thesis expressed in this chapter is that it *is* possible to reduce the frequency and severity of accidents and injuries to players in sports, athletics, physical education, and recreational sports, in or out of school, for young or old, male or female. To achieve this goal, sports activists must develop a philosophy which includes an understanding of the factors of accident causation, principles of accident prevention and injury control, responsibilities of individuals who participate in sports and recreation, and the relationships that evolve from community action.

FACTORS AND CAUSATION

The search for the cause of sporting accidents is no different from the search for the cause of any accident. Researchers have looked a long time for factors of accident causation in industry, traffic and transportation, and in the home. Only recently have they become concerned with the recurrence of sports injury. Man seeks simple explanations for complex events; accidents are complex and the search for causes may be very frustrating.

Accidents and their injuries are so varied in the surrounding circumstances that no one factor can be expected to stand out prominently. One underlying truth is evident — at the base of any accident are human factors (physiological, psychological, biomechanical, or biochemical), singly or in combination, with social or cultural variations. These factors would be meaningless without reference to the nature of man's work or play, the manner in which they are carried out, and the complex aspects of the environment. Accidents appear to be, as Brody has stated: "a matter of functional disharmony or imbalance between man and environment."[1]

Various authors in accident research avoid the words *cause* and *causation* or use *cause* as a synonym for the mechanism of injury, without indic ting how the injury came about. Another approach is noted in epidemiological studies where *causation* is considered more than an agent directly involved — rather it is a combination of the host, the agent, and the environment.[2] It is desirable to ask if there are any common factors without which accidents cannot occur. Damage to living and nonliving structures fall causally into a few groupings. These groupings reflect abnormal energy exchanges which may be thermal, mechanical, electrical, or ionizing and require mitigation of these abnormal exchanges for the prevention of damage.[3]

To begin to understand how various factors contribute to man's accident experience the physiological, psychological, and social human factors will be discussed more fully. The environmental factors to be considered are the physical, thermal, radiological, and electrical. It is also necessary to indicate what part chance plays in accidents.

Human factors

Physiological. When physiological equilibrium is attained by a person his accident potential should be at a minimal level. Hundreds of studies, although relatively few in the sports field, show that man's physiological dysfunctioning contributes to many kinds of accidents.[4] Some of the individual characteristics high on the physiological level related to accidents include: sex, age, emotivity, fatigability and fatigue, visual function, perception, attention, alcoholism and drug use, and changes in health. In some studies, women exposed to hazards have more accidents at certain times of the menstrual cycle. Women have a greater susceptibility to toxic substances and such factors may trigger an accidental event. Age, associated with physiological body changes, has often been related to accidents, although the evidence points primarily to psychosocial origins. Yet advancing years, and the concomitant chemical changes, do lessen neuromuscular efficiency.

Fatigue (physiological as differentiated from the more prevalent psychological variety) is an accident variable long noted. The tired gymnast, runner, or football player may misjudge and become involved in an accident. Another factor in accident causation, visual dysfunctioning, may stem from nutrient imbalance and its effect is to lessen perceptual awareness. Lastly, alcoholism and drug abuse alter human performance in athletic neuromuscular skill demands and may contribute to injury.

Psychological. Accident experiences in sports touch all phases of psychology. Simple human responses to sensory stimuli such as depth perception, spacial discrimination, reaction time, and kinesthetics are also of concern to sports participants and coaches. Neophytes in sports who react slowly to opponents moving forcefully toward them may collapse under the impact.

The application of learning theory and decision making responses affect players' responses. The study of human growth and development provides insight into skill acquisition. Learning skills, in degrees of difficulty, through progressive motor learning stages is essential to accident avoidance.

Behavioral deviations may affect the safety of sports performers. These may be emotional

[1] Leon Brody, *Human Factors Research in Occupational Accident Prevention* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1962), p. 3.

[2] W. Haddon, Jr. et al., *Accident Research* (New York: Harper and Row, Publishers, 1964), pp. 27-28.

[3] *Ibid.*, p. 28.

[4] International Occupational Safety and Health Information Centre (CIS), *Human Factors and Safety* (Geneva, Switzerland: International Labor Office, 1967).

disturbances of chemical or organic origin and may be chronic or acute. Excitement in or at sporting events may produce adrenalization which may or may not be effectively controlled. Aggression, a trait necessary for success in competitive sports, is also found frequently in persons whose accidents are not in the arena of sports activity.

Accident repeaters are superior in gymnastics and in crude strength. Individuals in team sports differ from persons in individual sports in psychological variables. Individual sports participants have a need to stand out and also have a higher accident record. Most coaches assess the drives and motives of players with considerable skill and attempt to control aggression and stress that may become hazardous. Stress is present in most accident situations and is usually of psychosocial origin.

Social. The social climate in sports and recreation can not be separated easily from the psychological factors which consider human behavior. Man is a gregarious creature who seeks companionship and recognition. He plays in sports not only to test himself but to be with others and to gain self-respect. Family pressures may influence a youth's selection or rejection of a sport. His very interest in sports may be secondary to achieving other goals. The parent who urges his son to be a chip-off-the-old-block and play football as dad did in college may set the stage for demands that a youngster may not be able to meet. An accident can then become the escape vehicle for getting the youth out of the sport he did not want.

Environmental factors

The complexities of a highly technological society introduce many environmental factors that are helpful as well as harmful to man. The old adage, "if you cannot stand the heat stay away from the fire," has some applicability to participation in sports. Discussed here are several of the environmental factors associated with accidents in sports and recreation.

Physical. Man's physical tolerance of pain, stress, and other forces varies considerably. Astronauts are selected and trained to meet exceptional demands for physical performance. Superior athletes can perform feats of physical strength or dexterity impossible to many. Individual differences are well-known. Man can go only so far below the sea or so high above the land before the pressure of water or the absence of atmosphere will destroy him. In competitive games two bodies cannot occupy the same space without the risk of injury. Noise from a crowd can drown out signals and well laid plans may fall apart. Pollutants in the atmosphere may impair performance in poorly ventilated sports areas. Excessive air pressure in inflatable sports equipment may harm the user because it is too hard for the hand to manipulate. There is no limit to the number of physical factors that may cause accidents or injuries to persons who are unaware or uninformed about hazards.

Thermal. Man can tolerate relatively small variations in heat before he experiences discomfort. Excessive external heat such as sunburn, fire and fireburns, acid and alkaline burns, and hot water contribute to his impairment. When man's limits for external heat are known it is hazardous to exceed them.

Excessive internal heat can cause death. If the body does not sweat when subjected to high temperatures, high humidity heat stroke may cause injury or death. Sports conducted in temperatures above 80 degrees, with the humidity more than 70%, require careful observation for early signs of heat exhaustion and heat stroke.

Electrical and radiological. In the sports field, electrical and radiological insults to participants are comparatively rare. Lightning deaths on golf courses or athletic fields strike about 50 persons annually in the United States; appropriate precautions are necessary to avoid this situation. Electrical equipment used at sports contests must be installed and handled by electricians to avoid danger to sports participants and spectators.

Chance

Human factors and environmental conditions may not be in the *right* combination for an accident to occur. Chance enters into an accident prone situation. By chance, existing conditions may produce a severe accident or a near-miss event. For example, a face bar on a football helmet passed inspection, although defective. It was used for many hours of play. The wearer was never struck on the face in play and no stress was placed on his face bar. On inspecting equipment, the coach noted the absence of a proper anchorage on the helmet, and with a slight blow, broke it. Had it been struck during play a serious injury might have resulted. Yet, through chance, no injury occurred. A high platform diver struck a shark and sustained a severe injury. The chance of a shark being in that area was remote and the likelihood of a diver hitting one was even more remote and yet that event happened.

There may be no statistical correlation between certain events and accident involvement, but a potential correlation is always present. Therefore, it is desirable to study sports activities and sports work conditions to detect those frequent near-misses which show that a sport is not *right*, or has a chance of producing an accident and harm. Breakdowns in systems can be detected by analytical epidemiological procedures and curbed long before statistical data begins to identify *wrong* conditions. Then efforts at correcting human and environmental conditions can be coordinated.

Near-miss. Near-miss refers to conditions surrounding an event that might have produced an accident, but did not. An example of a near-miss is a diver who enters the water from a three-meter board and brushes past another diver who has left a one-meter board improperly. A collision of two divers might produce an injury. Certainly, proper use of the boards should prevent collisions. A bus carrying a football team to a game experienced brake failure causing the bus to coast down a hill and roll to a stop on an upward slope — with no one hurt. Similar events would indicate a breakdown in some part of a system. Analysis and study should keep possible system breakdowns to a minimum. In sports it is wise to report all near-misses to responsible administrators. This will foster accident prevention measures and will prevent innumerable mishaps.

Risk. Risk is defined as the possibility of suffering harm, loss, or danger. Risk stresses chance or uncertainty, but often from the viewpoint of one who weighs them against possible gain or loss. The term may also imply involuntary exposure to harm or loss. Risks abound in sports, athletics, and physical education and are controllable to a significant degree. Some sports carry higher risks than others. What is needed is an effective method of assessing the risks involved in many of life's activities, including sports.

Risk acceptance. Risk acceptance implies a willingness to chance harm, loss, or injury. What constitutes an acceptable risk is a matter of personal and/or public analysis of danger. When risk factors are known one may calculate whether the potential benefits exceed the potential hazards. In sports, many risks are evident and a personal decision must be made by a player after careful calculations have been made. The decision also may be the function of a coach or an administrator. While a player may risk playing with an injury, his coach or team physician should be unwilling to have him take that risk. Environmental conditions may be hazardous, and while a team might be willing to take the risk and play, conference regulations might prohibit play when the temperature, humidity, or other factors exceed safe levels of human tolerance. What is needed in sports is a more effective way of assessing the risks that are reasonable to accept and more precise ways of defining those risks that reflect unwise or even stupid decisions.[5] Until such methods are refined, risk should be exercised with caution. Remember, it is the sports participant's welfare which should be of utmost importance; to risk a player's safety is to compromise one of the major goals of sports — to build healthy bodies.

[5] Kenneth S. Clarke, Accident prevention research in sports, *Journal of Health, Physical Education, Recreation* 40 (Feb. 1969), no. 2, pp. 45-48, 65-70.

PRINCIPLES OF PREVENTION

In the developing art and science of accident prevention and injury control the concept that *accidents are caused and do not just happen* has done much to destroy the illusion that accidents are uncontrollable and must be accepted stoically. Accident research has helped to identify significant factors in accident causation and to make accident reduction feasible. Much is known about factors that set the stage for a hazardous condition; less is known about motivating individuals to use available controls.

An engineer designs structures to make it difficult for accidents to happen. An enforcement specialist requires compliance with behavioral standards to control hazards. An educator attempts to develop the ability in students to make wise choices and effective decisions in the presence of danger. These professional disciplines aid in the safety achievement effort through exchanging information. Significantly in sports (where injuries are fewer than in traffic, at work, or in the home, and the acceptance of sports injury is often tolerated), professionals in the field have done little to improve conditions in terms of recurrence of injuries.

Safety is achieved to a significant degree by providing youth and adults with attitudes, skills, and knowledge about hazards and their control. Hazards are everywhere in our environment. Their control can be achieved through the effective application of four fundamental principles:

1. Recognize the hazards
2. Remove hazards where feasible
3. Control hazards that cannot be removed
4. Create no additional hazards.[6]

RECOGNITION OF HAZARDS

An understanding of the hazards of any sporting activity requires a thorough knowledge of that sport: equipment and facilities, the leadership provided, fitness requirements of the participants, nature of the skills necessary for success, and the demands placed on personnel involved in the activity by themselves and their community.[7,8]

The possibility of drowning is recognized by water sport enthusiasts. These enthusiasts generally try to develop the skills associated with the particular water sport. But some of them do not. For example, scuba divers who have not learned well the physics and physiological requirements for the use of air at varying depths, and the need for carefully timed ascent and decent, will experience difficulties. Also, any physical anomalies, like intestinal distress or a head cold, may impair the scuba diver's performance. In one incident, 24 sky divers jumped into clouds without knowing that a lake was under those clouds; most of them lost their lives by drowning.

Football is a contact sport. Collisions and innumerable stresses and strains are placed upon players. Not knowing how to meet the impact of a hard tackle and fall properly could result in an injury. Fundamental skills must be practiced and physical conditions must be good to enjoy playing football. Equipment is designed to protect players and must be used for the purpose intended. Worn, improperly fitted equipment increases the risk of injury and must be avoided.

When a football field is not adequately maintained small holes, stones, or broken glass may cause injury. Knowledge of proper field maintenance is essential for controlling hazards.

Where leadership in a sports activity is effective, accidents and injuries are curbed. Coaches who are well trained and well informed have a capability for transmitting much of their

[6] American Association for Health, Physical Education, and Recreation, *School Safety Policies with Emphasis on Physical Education, Athletics, and Recreation* (Washington, D.C.: The Association, 1968), p. 8.

[7] H. J. Stack and J. Duke Elkow, *Education for Safe Living*, 4th ed. (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966), pp. 166-68.

[8] C. P. Yost, Total fitness and prevention of accidents, *Journal of Health, Physical Education, Recreation* 38 (March 1967).

knowledge to their players. Also, the officials who control sports contests have an essential role in preventing injuries through their quick detection of dangerous infractions of rules or an emotional climate that may be explosive. The dangerous practices of unnecessary roughness and piling on can be controlled by effective officiating.

Sand lot football is dangerous because of poor officiating, inept coaching, no medical staff, and poor equipment and facilities. Such factors often lead to recurrent accidents and injuries. Intramural sports activities, with their high rate of injuries and accidents, reflect untrained participants, inept coaching, untrained officials, and frequent overcrowding of facilities. It is definitely possible to control accidents and injuries in intramural sports and sand lot football, as well as in all other sports. A knowledge of incipient hazardous conditions is helpful in applying effective controls.

Removal of hazards

Often in recreational sports and physical education, when administrators believe an activity is dangerous, that activity is dropped. Accidents that recur in many sports can be greatly reduced when known hazards are removed. It is far better for authorities to continue a sport for the values it has than to jettison it for failure to apply effective controls, including analyzing accident data fully and finding better measures for controlling injury.

When environmental conditions are hazardous, the responsibility for removing danger falls on the persons in charge of an activity. When the danger of lightning is evident, a lacrosse game, a golf match, a surfing contest, or a sailboat race should be stopped by the officials. Where a playing surface is not level, where floors are needlessly slippery, where lighting is inadequate, where air pollution of an arena is recognized, the administrators need to arrange for better maintenance of the field, provide slip proof compounds on floors, and improve lighting and ventilation before scheduling the facilities for use. When it is suggested that worn or outdated equipment be used, a coach and the community should refuse to play until safe equipment is assured.

Hazardous human factors that may be controlled include the following: unequal competition, too many contests in a short time interval, insufficient conditioning prior to participation, inadequate medical detection of anomalies which bar sports participation, inept skills, too little knowledge of the sport and attitudes of extreme risk taking. Sports authorities need to plan carefully to equalize competition; to control the frequency of contests and length of the playing season and pre-season training; to set the requirements for efficient medical examinations of all participants; to provide for the progressive development of sports skills, training, and education in the fundamentals of a sport; and to give leadership to the development of desirable attitudes for safe sports participation.

Compensation for hazards that cannot be removed

When it is impossible to remove a hazard, compensate by developing intervention techniques or using other controls. While no safety device is perfect, research will provide information on the most valuable procedures to employ. The mouth protector in football, the hard hat in baseball, the wet suit for cold water sports, and the aluminum cup in boxing are examples of devices which compensate for an inability of the organism to withstand impact or discomfort without assistance. The water skier who wears a carefully selected life belt will be held afloat until his towboat crew rescues him in the event he has lost his breath in a fall. Legislation requiring two men in a motor boat that is pulling a water skier is a form of compensation since the boat driver cannot watch the water ahead and at the same time be fully aware of what the skier is doing behind him.

Effective leadership should provide students, players, and sports recreation enthusiasts with some of the procedures for progressive skill training, information about improved safety devices, and advice on other controls. It is essential to compensate for or adjust to those hazards that cannot be removed. To do less might cause injury.

Avoidance of additional hazards

Any factor which reduces a player's performance capabilities will endanger his participation. Factors may be physical, physiological, or psychological. Alcohol is a depressant. The danger of drowning increases when the alcohol level in an individual mounts. The skills of sports car racing or piloting a plane are hampered by the use of alcohol. Using alcohol or other depressants increases the hazards of any activity requiring clear thinking. There is a popular notion that some drugs enhance the physical powers of man. Medical science knows no substances: ". . . a well-trained athlete's performance cannot be improved pharmacologically."[9]

Unequal competition sets the stage for injury and accidents. Performers who are outclassed in skill or weight or other variables may not achieve success. The middleweight boxer who enters the ring with a heavyweight opponent is giving up a marked advantage to the heavier man. The overfatigued golfer may be forced to retire from a match if exhausted from too many contests scheduled with too short rest intervals. In a physical education class mismatched opponents in a line soccer game resulted in a broken leg when a 95 pound youth kicked the ball at the same time his 190 pound opponent did. A charge of negligence against the teacher was sustained in the courts and damages awarded the smaller youth.

Poor equipment and inadequate facilities often result in injuries to players. It would be better to alter the sport until effective equipment, facilities, and leadership are provided.

INDIVIDUAL RESPONSIBILITIES

Man's safety is a public responsibility; it is also a personal responsibility. When the public rejects hazardous activities and dangerous equipment, a public or national philosophy of safety is expressed. Public acceptance of automotive deaths has been strained. Demands for less product failures, improved roads, and better drivers reflect public annoyance with traffic experiences. The personal acceptance of the role each driver must play in contributing to safer driving is being stressed with motorists. Similarly our concern with sports injuries and deaths is reflected in news reports and in professional journals and publications. The public displeasure with needless injuries creates demands for controls. The awareness of individuals that safety is also an individual responsibility evolves from a realization that personal safety is not completely provided by others.

In the safety field it is sometimes said that what is everyone's responsibility is no one's concern. To tell all persons to be safe will probably influence no one. To alert each individual to his personal prerequisites for safe behavior in a complex environment has long been the concern of safety educators.

Each individual must learn to apply the fundamental principles of safe behavior in the presence of hazards. The principles of coping with and not creating additional hazards must be applied by individuals as they approach any activity. In the sports, physical education, and athletic fields, considerable effort is expended by groups to provide for the safety of participants. Beyond that effort each participant assesses his capacity, motivation, risk acceptance, and attitudes relative to each activity in which he will participate. Listed below are important principles in such a personal assessment:

1. Study the sport and the hazards within it as you advance in skills and participation in that activity.

[9] Ernst Jokl, Athletics and drugs, *Annual Safety Education Review* (Washington, D.C.: American Association for Health, Physical Education, and Recreation, 1968), p. 58.

2. Determine your physical and emotional fitness to meet the demands of an activity. (Use medical and other counseling opportunities for objective assessment of your readiness and avoid the use of only subjective judgment.)
3. Learn what the limitations are in the equipment and facilities.
4. Use equipment, facilities, and supplies only for the purpose intended.
5. Refuse to participate in a hazardous activity unless protective equipment is properly fitted and provided.
6. Secure instruction from qualified personnel. (It is better to learn from the experiences of others than to experience misadventure initially by oneself.)
7. Keep others informed of what, where, and when you plan to go before entering an area known to be hazardous.
8. Act your age.
9. Use progression in skill development; become proficient in simple skills before moving on to more advanced ones.
10. Be ready in advance to send for assistance if it is needed. (Example: the first aider who always carries a dime for a phone call, or, the coach who carries the roster and home addresses, names of parents and physicians of players in the event consent for medical treatment or other problems arise when on a trip.)
11. Develop through practice a neuromotor conditioned response system that will be ready and able to cope with hazards immediately.
12. Provide for prompt and effective medical treatment of injuries and insist upon an adequate follow-up treatment to make possible a quick return to participation.
13. Accept your responsibility for your fellow man; assist him to achieve safety in the presence of danger.[10]

These principles may be more fully analyzed by each individual who assesses his personal responsibility for safe participation in sports and athletics. Anyone engaging in sports must set desirable goals for himself and those who share activities with him. Most of the accidents in sports are caused by human behavorial faults, including an omission or commission of an act in the presence of danger. Perhaps 60% to 70% of accidents in sports and sports recreation can be eliminated. Self-discipline and a sense of personal responsibility are important if one is to live safely in the presence of hazards.

COMMUNITY RELATIONS

The individual alone cannot solve the problems of hazard and injury control in sports, athletics, and physical education; group understanding and community action are essential. Additional research on sports injury is needed, and since individuals alone cannot take on so large a task it must be supported by professional organizations. Efficient methods of sports injury control need to be applied by communities for the safety of all individuals.

Each community may determine the kind of safety it wants and is willing to buy. Action programs for safety have been established in many communities. Local safety councils and committees have been formed to attack specific problems. Generally, they have started with an attack on traffic deaths and injuries, moved on to work, industrial and home injuries, and then to the schools' responsibility for safety education. Safety committees may establish substructures which will concern themselves with more confined areas, such as sports safety. In turn such committees, while considering local community problems, also become involved with other agencies expressing concern on the same area. Local medical groups have formed sports injury control committees with other professional persons and some participate not only

[10] Stack and Elkow, *op. cit.*, pp. 91-93.

locally but nationally with the American Medical Association Committee on the Medical Aspects of Sports or the American Association for Health, Physical Education, and Recreation's Safety Education Division. Publications like *School Safety Policies, Annual Safety Education Review*, and *Desirable Athletic Competition for Children of Elementary Age* are examples of printed materials designed to influence local action for the welfare of sports participants.[11] Efforts of this kind will continue until a larger nucleus of sports injury control personnel communicates effectively with community leaders to achieve greater sports safety for our increasing number of sports participants.

Schools in every community are expected to provide instruction in safety, a safe school environment, and proper safety services. If youth are taught safety well, much of what they learn should last them a lifetime. Obviously schools cannot guarantee an accident free life. Therefore, other agencies are formed to influence the public. These include adult education, the news media, the courts, and many others. A foundation for effective living *is* initiated in the schools. Each school establishes basic policies that give a direction to be taken in its school safety program. Such policies are described fully in *School Safety Policies*. They cover efficient planning where students, teachers, administrators, school board members, parents, community agencies or governmental groups, and interested citizens work together to determine the size, scope, methods, and evaluative procedures that need to be used for safety achievement in a community. Plans for all probable hazard control problems must be developed by such responsible individuals and groups through adequate organization and programming, efficient use of personnel, and proper evaluation.

Other approaches covered in *School Safety Policies* are concerned with curriculum and instruction: facilities, equipment, and supplies; first aid and emergency care procedures; and reporting and investigating of hazards and accidents. Such policies are discussed more fully in the next section of this text. Out of these broad policies a large number of principles and procedures and practices may be developed to serve the needs of any school or recreational organization.

From the foci of community schools safety policies may be dispersed providing for community sports recreational activities including playground, athletic, and individual sports programs like golfing or boating, or any of the 50 or more activities covered in the sports section of this book. Other organized groups like little leagues in football or baseball may participate in various safety programs and apply some of the school safety policies to fit their particular needs. A community safety council may keep alert to any increase in accidents or injuries in particular sports and initiate a public education effort through various media to inform, motivate, and influence behavior in a direction that is designed to reduce mishaps. When specific problems arise, communities may support research activities to determine if education, engineering, or enforcement procedures offer the best means for controlling failings in the safety of a particular sport.

The broad nature of sports activities takes outstanding athletes into competition in the world community where international controls are established and then changed as conditions require. Analysis of sports injuries and accidents to international performers provides information which may enable local controls to be established for sportsmen.

Significantly, accident rates continue to be highest in those categories that involve personal responsibility. Fine work and even industrial safety records are marred by personal carelessness, irresponsibility, or lack of cooperation. The idea that accidents happen to the other fellow has mitigated against the development of personal safety habits and responsibility. In time, an enlightened society may develop more

[11] American Association for Health, Physical Education, and Recreation, *Desirable Athletic Competition for Children of Elementary Age* (Washington, D.C.: The Association, 1968); *School Safety Policies with Emphasis on Physical Education, Athletics, and Recreation* (1968); *Annual Safety Education Review* (1962 to 1970).

fully the concept that accident and injury control is every individual's responsibility and concerns the world community.

Life without risks might provide few adventures, if any — there would be few challenges in sports. We must continually move on in the presence of risks. Yet if man will assess these risks, abandon those that are inordinate, control those that can be controlled, and create no unnecessary hazards, he will gain much from sports participation and receive the benefits that sports hold in store for him.

References

American Association for Health, Physical Education, and Recreation. *Annual Safety Education Review.* Washington, D.C.: The Association. 1962 to 1969. Annual.

———. *School Safety Policies with Emphasis on Physical Education, Athletics, and Recreation.* Washington, D.C.: The Association, 1968.

American Public Health Association. The role of physicians and public health workers. In *Accident Prevention.* Edited by Maxwell N. Halsey. New York: McGraw-Hill Book Co., 1961.

Florio, A. E. and Stafford, G. T. *Safety Education.* 3d ed. New York: McGraw-Hill Book Co., 1969 459 pp.

Haddon, W., Jr.; Suchman, E. A.; and Klein, E. *Accident Research.* New York: Harper and Row, Publishers, 1964.

National Safety Council. *Accident Facts.* Chicago: The Council. Annual.

Seaton, Don Cash; Stack, Herbert J.; and Loft, Bernard I. *Administration and Supervision of Safety Education.* New York: The Macmillan Co., 1969. 368 pp.

Stack, H. J. and Elkow, J. Duke. *Education for Safe Living.* 4th ed. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966. 374 pp.

Strasser, Marland K. et al. *Fundamentals of Safety Education.* New York: The Macmillan Co., 1964.

Thorndike, A. *Athletic Injuries.* Philadelphia: Lea and Febiger, 1961.

ADMINISTRATION AND SUPERVISION

PART II

Administration and Supervision—Introduction

CHARLES PETER YOST, Ph.D.

Administration deals with the activities of those charged with facilitating the efforts of people in accomplishing a definite purpose. It is the school administrator who has the responsibility for an overall safety program. His attitude and knowledge will determine the effectiveness of the program. His chief task is to manage both human and material resources. In managing these resources he provides adequate supervision to handle both curricular and noncurricular activities.

The functions of administration and supervision overlap depending upon the size of the organization. A school principal, for example, might be a supervisor in a small organization. The supervisor's role at times entails administrative responsibility.

While supervision generally is concerned with the improvement of instruction, it has a broader scope in relation to a safety program. In addition to curricular matters, the safety supervisor usually is responsible for providing a safe environment and safety services. The specific activities of a safety supervisor are to:[1]

1. Help the entire school staff see safety education as an integral part of the curriculum.
2. Develop instructional guides for use by all teachers.
3. Identify the safety needs of the pupils and plan cooperatively.
4. Appraise existing curricular content for safety education adequacy.
5. Know the sources of current safety materials for both student and teacher use.
6. Work with teacher-sponsors of school safety organizations (safety councils, safety patrols, safety committees, and safety clubs).
7. Use accident reports as a preventive, defensive, protective, and/or constructive device.
8. Inform the school staff of legal aspects involved in safety.
9. Secure the cooperation of out-of-school agencies for service and assistance.
10. Guide teachers in selecting safety education materials.
11. Publicize and interpret the school safety program to the public.
12. Exert leadership in organizing and conducting emergency drills.

[1] Charles Peter Yost, Who should teach safety, in *Current Administrative Problems — Athletics, Health Education, Physical Education, Recreation* (Washington, D.C.: American Association for Health, Physical Education, and Recreation, 1960), pp. 177-78.

13. Cooperate with the school administrator in removing building hazards and in planning the construction of new buildings.
14. Appraise the suggestions and criticisms of community groups regarding the school safety program.
15. Cooperate with community agencies in serving as a speaker, in supplying the names of speakers, and in securing instructional aids.
16. Keep informed on the latest developments in the safety field.
17. Cooperate with the school administrator in conducting in-service educational programs for all staff members including custodians, bus drivers, and luncheon personnel.
18. Assist and encourage teachers to do research.
19. Take an active part in community safety activities which, in turn, have an influence on the total school safety program.
20. Evaluate the school safety program.

It matters not so much whether a safety supervisor is responsible for the preceding activities. The important point is that within every organization there should be *someone responsible* for these activities. His title may be supervisor, coordinator, director, consultant, specialist, or anything else which concurs with local administrative policies.

SAFETY POLICIES

A policy is a statement which gives direction for achieving a desired objective. The area of administration and supervision usually operates through policies. The following policy statements can provide a sound safety program.[2]

General school safety policies

Planning

1. In establishing policies, participation should be invited of all persons and groups concerned: students, teachers, administrative staff members, aides, school employees, board of education members, parents, representatives of community or governmental groups, and other interested citizens.
2. A faculty-student committee should be organized to advise on accident prevention and ways of achieving safety.
3. Provision should be made for the use of advisory services from professions, such as medicine, law, insurance, engineering, and safety, to help plan and evaluate accident prevention procedures.
4. All schools should have a comprehensive school safety program, including safety services and education and a safe environment.
5. Schools should have an accident reporting and investigation system.
6. Administration has the responsibility for adherence to provisions of school law, state and local laws, codes and ordinances, and contractual agreements.
7. School officials should develop cooperative relationships with official agencies such as fire, health, and police departments.
8. Adequate insurance programs should be maintained by all schools, with details of the coverage and limitations understood by all school personnel.
9. Parental approval should be obtained for student participation in activities that remove students from their normal school routine.
10. The school should make detailed plans for handling all anticipated emergencies.

[2] American Association for Health, Physical Education, and Recreation, *School Safety Policies with Emphasis on Physical Education, Athletics, and Recreation* (Washington, D.C.: The Association, 1968), pp. 11-13.

11. There should be a detailed plan for the safe handling of spectators and crowds at all school activities and events open to the public.
12. Recommendations for building requirements and review of plans should involve teachers and other school personnel. Thus architects and engineers, in developing safe facilities, can be made aware of potential hazards recognized by an experienced staff.
13. Every school should have a well defined plan for handling emergency care problems, including parental approval for transportation and emergency medical care. Arrangements for emergency care and transportation should be made in writing at the beginning of the school year.
14. The content, objectives, structure, and teacher qualifications for driver and traffic safety education should conform to nationally recommended standards.

Organization and Program

1. Each school should designate a school safety coordinator to direct the total accident prevention program.
2. Provision should be made for the development of a comprehensive safety education curriculum.
3. Major consideration should be given to factors such as scheduling, class size, and grouping, which have a bearing upon the prevention and control of accidents.
4. Specific accident prevention procedures should be developed for the movement of students within school and to and from school, as well as in school sponsored activities.
5. All safety rules and regulations should be included in the school's administrative handbook.

Controls

1. All students and staff members should be familiar with their responsibility to report immediately any hazardous condition, dangerous activity, property damage, or injury, in accordance with established procedures.
2. All school personnel should comply with rules and regulations governing safe practices and procedures.
3. Close supervision should be provided wherever students participate in potentially hazardous activities.
4. All safety rules governing the use of facilities, equipment, and supplies should be conspicuously posted.
5. Regulations regarding the use of school facilities by nonschool groups should include specific provisions for safety and accident prevention. Copies of these regulations should be provided to all concerned.
6. Information about the health status of students and school personnel should be made available to appropriate staff.
7. Approval from a physician, with notification of any activity limitations, should be obtained before any student is readmitted to school after a serious injury or illness.
8. Only equipment and supplies that meet highest standards of safety should be purchased and used by schools.
9. Students should be required to make proper use of protective equipment in hazardous activities.
10. Equipment, devices, materials, or animals which may be potentially dangerous should not be allowed on school property without prior approval of appropriate school officials.

Personnel

1. All personnel involved in the operation of the school program should have an understanding of their specific roles in accident prevention.
2. All instructional personnel should be properly certified for their area of instruction.

3. Noninstructional personnel of the school, such as bus drivers, recreation aides, and custodians, should be qualified to carry out specific safety assignments.
4. Teacher training institutions should provide for preservice education in safety for prospective teachers and administrators.
5. School personnel should be informed of new findings and best practices in accident prevention and injury control.

Evaluation

1. A system should exist for appropriate inspections and evaluation of facilities, equipment, and buildings as a basis for improvement.
2. There should be a system of accident investigation and reporting to provide information for evaluation.
3. There should be a continual updating of accident prevention policies, procedures, and practices.
4. Analysis of accidents, injuries, and damage should be made and periodic summaries of such data should be distributed to appropriate individuals.

The preceding policies are broad statements and deal with a comprehensive safety program of which a sports safety program is a part. The next seven chapters deal with administrative policies and procedures in terms of "controls." Chapter 4 specifically relates to external controls while Chapters 5 through 11 deal with internal controls, particularly as related to safety in physical education, athletics, and recreation. The remaining chapters in the text deal specifically with safety in selected sports or activities.

References

American Association for Health, Physical Education, and Recreation. *Current Administrative Problems — Athletics, Health Education, Physical Education, Recreation*. Washington, D.C.: The Association, 1960. 197 pp.

Dzenowagis, Joseph D. School safety policies. In *Annual Safety Education Review*, pp. 65-72. Washington, D.C.: American Association for Health, Physical Education, and Recreation, 1969.

Florio, A. E. and Stafford, G. T. *Safety Education*. New York: McGraw-Hill Book Co., 1969. 459 pp.

Seaton, Don Cash; Stack, Herbert J.; and Loft, Bernard I. *Administration and Supervision of Safety Education*. New York: The Macmillan Co., 1969. 368 pp.

Stack, Herbert J. and Elkow, J. Duke. *Education For Safe Living*. 4th ed. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966. 374 pp.

Strasser, Marland K. et al. Organization and administration of the school safety program. In *Fundamentals of Safety Education*, pp. 117-35. New York: The Macmillan Co., 1964.

Administration and Supervision—External Controls

CLIFFORD B. FAGAN, M.A.

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Athletic programs with educational objectives must have as one of their primary concerns the health and safety of each participant. This is a task that to an appreciable degree must be exercised through external controls, which are the rules and regulations imposed by a national organization responsible for the supervision of a given sport. In contrast, internal controls are exerted by an athletic team staff or sponsoring institution.

There are a number of health and safety reasons for external controls imposed by a national organization.

1. A national organization can give continuous attention to the sum of the experiences witnessed at the local level.
2. A national organization can convene the expertise required to anticipate, interpret, and act upon patterns of injurious behavior.
3. A national organization can be objective to problems that are subject to emotional and provincial bias.
4. Sports involve the athlete so deeply that normal inhibitions may give in to overstrenuous or reckless behavior.
5. The athlete who disregards risks often is accorded hero worship and this kind of recognition can interfere with his acceptance of safeguards.
6. Demands of competition in certain sports place the athlete in an environment that leaves little room between risk and hazard.
7. The expectation to win is so profoundly imposed by the community on the coaching staff that the temptation to take a chance or to take advantage is quite real.

Consequently, external controls in sports are meant not only to describe the essence of a sport but also to protect an athlete from his emotional self. The best rules describe the safe conduct of a sport and rely on the integrity and respect of the athlete's supervisors. Unfortunately, in each sport rules must be added to curb known patterns of undesirable behavior.

Rules are formulated in different fashions by various organizations. Customarily, a national group structures its rules to apply to programs involving its particular type of athlete (little league, high school, professional). The rule makers are members of committees that have a systematic method of collecting results of data, surveying coaches' opinions, following experimental innovations, and offering experienced judgment to problems. The end product is an updated rules book.

Within the rules book often are found "points of emphasis." These are considerations that do not lend themselves as well (or yet) to specific rules, but are sufficiently important to highlight for supervisors. It is not unusual that a new rule is a product of previous points of emphasis that have either required more study and refinement for application or additional time for the change to be made on a mandatory basis.

Beyond the national rules book are regulations. These are special procedures peculiar to a group of teams (league or conference) that go beyond the rules yet still qualify as external controls. They may be an experimental change, an abuse control inserted specifically to combat a more localized pattern of undesirable behavior, or simply a more stringent extension of an existing rule. Most national rules groups not only permit experimental innovation but actively encourage it. These changes, however, are scrutinized as being purposeful and having potential benefit. Adaptations are a significant part of the task of rules and regulations groups and valid adaptations result only from a controlled program of experimentation and research.

Examples

Consideration must at times be given to eliminating types of activity that are unduly hazardous. The "clip" in football, the "slam" in wrestling and in basketball, the move of a player under an airborne opponent, all evolved from zealous coaching and participation. Yet all are injurious situations which required specific outlawing rules.

Because of the findings of current research, protective equipment specifications have been added to most rule books. Initially, these specifications were met with resistance by athletes and coaches, but eventually, when "everyone had to do it" and thus no one stood out as a "sissy," the resistance subsided.

The matching of opponents by physical size and/or maturity, the playing time of the game, the equipment, and the field size all constitute another category of adaptations. Definitions of boundaries for athletes as well as for spectators are also products of more than tradition.

Policy requirements include the securing of a medical certificate confirming the physical fitness of each participant; a minimum time requirement of conditioning and practices prior to competition; and, in some instances, the presence of a physician on the bench. These conditions are usually stipulated when individual programs are either lax or need authority for such policies.

Sometimes arbitrary regulations must be made. The maximum number of games an athlete can play in a season is an external control because of the abuses that have occurred. There is no magic figure such as 15, 20, or 25 contests after which an athlete encounters undesirable competitor experiences. But a reasonable figure must be selected that at least deters the chances of such an excess and that all athletes must share as a limit. Similarly, in wrestling there is no magic associated with a wrestler's talent when he weighs a few pounds more or less than a competitor. Yet tradition and fear of loss of advantage maintain that a wrestler should lose weight (sometimes drastically) to avoid meeting a rightful opponent. Consequently, rules impose controls on the weigh-in and the weight classes for which a wrestler can be eligible.

Officiating

Without officiating, the values of external controls are negated. The quality of officiating is directly related to the prevention of injury, the preservation of sportsmanship, and the fair and consistent application of the rules. Officials must be qualified emotionally and technically for their responsibilities. To insure this, they must be thoroughly schooled in both the letter and spirit of the rules. Sponsoring organizations conduct national and area clinics to help officials to qualify on the technicalities, procedures, conditioning, and judgments that constitute effective officiating. Only individuals whose experience and training have been certified should officiate. In fact, more schools and agencies should consider using certified officials not only in competition but in scrimmage as well.

Statutes and insurance plans

To insure that athletic competition contributes to desirable educational outcomes, coaches at the interscholastic level are almost universally required to be certified teachers. This establishes their responsibility to the school and gives them faculty status.

The establishment of negligence in a few cases and the legal recognition of a coach's liability have motivated coaches to take greater care in providing proper protection and adequate health safeguards. Several states now have legislation which permits tax funds to subsidize interscholastic athletics. Increased safety has been the major consideration for the adoption of such legislation. The great majority of interscholastic athletes are protected today by insurance or benefit plans. Some conferences collectively provide catastrophe insurance for expensive, prolonged care injuries. Not only do these coverages insure that the athlete will receive proper medical care in case of injury but the information contained in the insurance records is invaluable for the study of accident frequency and causes. Also, protection is a health measure which assures the athlete of medical examination even though injury is not ascertained.

Sources of Official Playing Rules

ARCHERY	National Field Archery Association, Route 2, Box 514, Redlands, Calif. 92373 (Write for Constitution and By-Laws)
BADMINTON	Lester E. Hilton, ABA Rule Book, 15 Tanglewood Dr., Cumberland, R.I. 02864
BASEBALL	National Federation of State High School Athletic Associations, 7 S. Dearborn St., Chicago, Ill. 60603
BASKETBALL	(See Baseball)
BOWLING	American Bowling Congress, Public Relations Dept., 1572 E. Capitol Dr., Milwaukee, Wisc. 53206
FENCING	Amateur Fencer's League of America, 33 62nd St., W. New York, N.J. 07093
FIELD HOCKEY	General Sportcraft Company, Ltd. 140 Woodbine St., Bergenfield, N.J. 07621
FOOTBALL	(See Baseball)
GIRLS' SPORTS	NEA Publications-Sales, 1201 16th St., N.W., Washington, D.C. 20036
GOLF	U.S. Golf Association, 40 E. 38th United States Golf Association, 40 E. 38th St., New York, N.Y. 10016
GYMNASTICS	College Athletics Publishing Service, 347 E. Thomas Rd., Phoenix, Ariz. 85012
HANDBALL	National YMCA Handball Rules, Champion Glove Manufacturing Company, 2200 E. Ovid St., Des Moines, Iowa 50313
	United States Handball Association, 4101 Dempster St., Skokie, Ill. 60076
HORSESHOES	(See Field Hockey)
ICE HOCKEY	(See Gymnastics)
ICE SKATING	Amateur Skating Union, 8941 Crest Oak Ln., Crestwood, Mo. 63126
ROLLER SKATING	United States Amateur Roller Skating Association, 120 W. 42nd St., New York, N.Y. 10036
SHUFFLEBOARD	American Shuffleboard Leagues, Inc., 533 Third St., Union City, N.J. 07087
SKIING	(See Gymnastics)
SKIING (Downhill, Slalom & Giant Slalom)	E. Packard Anderson, Executive Vice President, U.S. Ski Association, 1726 Champa, Suite 300, Denver, Colo. 80202
SOCCER (High School)	John K. Archer, Senior High School, Malverne, N.Y. 11565
SOFTBALL (12")	Amateur Softball Association, Skirvin Tower, Park Ave. & Broadway, Oklahoma City, Okla. 73102
SWIMMING	(See Gymnastics)
TABLE TENNIS	United States Table Tennis Association, 210 Satum Dr., North Star, Newark, Del. 19711
TENNIS	United States Lawn Tennis Association, 51 East 42nd St., New York, N.Y. 10017
TRACK & FIELD	(See Baseball)
VOLLEYBALL	United States Volleyball Association, USVBA Printer, P.O. Box 109, Berne, Ind. 46711
WATER POLO	Amateur Athletic Union of the United States, 233 Broadway, New York, N.Y. 10007
WEIGHT LIFTING	(See Water Polo)
WRESTLING	(See Baseball and Gymnastics)

Administration and Supervision—Internal Controls | STANLEY F. PECHAR, Ed.D.

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The task of providing for the health and safety of each participant in sports programs includes internal controls, which refer to administrative and supervisory procedures within the school or college. Administrative personnel, supervisors, teachers, coaches, and students must understand their roles in providing for the welfare of the participant in sports.

Part of the American tradition of education is that the public schools be responsive to the will of the people and that the curriculums reflect the needs of the community. States delegate to boards of education the authority to control and maintain schools. The board of education, in most cases an elected body of 5 to 14 members, makes policy and legislates for the schools within its system. One of the board's most important tasks is the selection of the superintendent.

The superintendent is the educational leader and chief educational officer of the community, responsible for implementing the board's policies. He may work as an individual or delegate powers and institute a large central office depending upon the size of the school system. Many school districts have a safety supervisor, who serves in a staff relationship to the superintendent. His functions include:

1. Determination and coordination of administrative policy in safety
2. Development of safety curriculums
3. Improvement of safety instruction
4. Development of improved community coordination in safety
5. Evaluation of the effectiveness of the safety program.[1]

The principal coordinates his safety efforts with those of the superintendent and/or his delegated representative. Frequent and good communication between the principal and the central office keeps the superintendent aware of the progress of the programs within the schools. Frequently because of school size and the resulting complexities of his position the principal will delegate the responsibility for the school safety program to the assistant or vice principal.

With regard to the reduction of accidents in the school physical education, athletic, and recreational program there are specific measures that the principal can carry out.

1. In program planning and scheduling, the principal should avoid overcrowding of classes and attempt to group pupils in classes according to their age and grade classification.

[1] For further discussion on these functions, see Herbert J. Stack and J. Duke Elkow, *Education for Safe Living*, 4th ed. (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966), pp. 301-303.

2. The principal should expedite the repair of equipment, supplies, and facilities and carry out plans for structural changes which benefit the program and promote safety.
3. To familiarize himself with the various safety aspects of the program, the principal frequently should visit physical education classes, athletic contests and practices, and the recreational sports program.
4. The principal should exercise his supervisory duty with regard to teachers and coaches in the physical education and athletic programs.

The department chairman or director of physical education and athletics is responsible for insuring safety within the various facets of his program. He works in close cooperation with the school district safety supervisor and the school safety officer. His prime safety responsibilities include:

1. Adoption of a uniform procedure for reporting, recording, and investigating all accidents within the program
2. Provision and maintenance of safe equipment and facilities including safe storage
3. Provision of first aid and emergency treatment for all injuries as well as any indicated follow-up treatment
4. Securing of certified and qualified teachers, coaches, and officials
5. Formation of an accident prevention committee
6. Provision of safe transportation of athletic teams and other sports participants
7. Formulation of special emergency procedures for fire and other disasters.
8. Approval of the course of study in physical education as well as the contests scheduled for the athletic teams and other sports participants.

Physical education teachers and coaches are in the best possible position to influence their students regarding safe athletic participation because of the daily personal contact they have with their students. Through their own practice and teachings, they can most readily instill in their pupils desirable attitudes, knowledge, and skills concerning safety, such as:

1. Recognition of hazardous situations and their prevention and/or control
2. Avoidance of unnecessary risks
3. Carrying out of rules and regulations in sports and athletic participation
4. Importance of appropriate amount and types of warm-ups and conditioning as well as proper skill development
5. Necessity for being alert during activity participation
6. Understanding of the importance of wearing protective equipment and personal equipment prescribed for the various activities
7. Learning of activity techniques by progressing from the simple to the more complex in appropriate stages.

HOMOGENEOUS GROUPING FOR SAFE COMPETITION

A necessary administrative control for achieving safety in physical education classes is placing pupils according to age-grade level.

One of the findings in a study by Lloyd, Deaver, and Eastwood indicated that groupings on an age-grade basis correlated with a lower accident involvement.[2] Within classes as well as in the intramural and interschool program additional classification must take place to insure safe participation. One of the vitally essential ingredients in the prevention of accidents and resulting injury is the development of skill. The skilled person uses his body more efficiently than the unskilled. According to Hein, "It is the awkward unskilled player who, other things being equal, most often injures himself or others

[2] Frank S. Lloyd, George C. Deaver, and R. Eastwood, *Safety in Athletics* (Philadelphia: W. B. Saunders Co., 1936).

in physical recreation activities."[3] Inequalities in ability levels pose a serious safety problem if the skilled and unskilled compete against each other, particularly in contact sports. The implication for coaches and physical education teachers is that they classify their pupils according to their abilities and conduct competition within these homogeneous ability groupings.

The size and weight of individuals have been used as a factor in classifying pupils for competition in such sports as wrestling and football. For years the Ivy League colleges had a program in 150 pound football which appeared to be low in incidence of accidents and injuries. Persons conducting football programs might consider weight equality between teams.

An important factor in achieving safety in sports is the physical condition of the individual. Physical conditioning hardens the body, increases resistance to fatigue, and builds strength, agility, and endurance. A pupil should be able to cope with the physical demands of the activity in which he wishes to participate. Therefore, physical condition should be used as a basis for classifying pupils before permitting participation in a given activity.

PROPER CONDUCT OF ACTIVITIES

If activities are to be conducted with a minimum risk of accidental injury, persons responsible for the conduct of these activities must provide proper and continuing supervision; educate the participants; and control the environment. These criteria would apply whether or not the activities were conducted on the class, intramural, interschool, or recreational level. However, because of the advanced level of play, frequent intensity of competition, and presence of over-emphasis, these approaches should be particularly followed in interschool competition.

Interschool athletics for girls

Past arguments that interschool athletics for girls has an adverse effect on the reproductive function, adds difficulty during menstruation, and produces a masculine, unladylike woman have gradually dissipated. Women leaders in physical education recognize the importance of competitive sports as a valuable training for their role in modern life. They have indicated that interschool athletics for girls should be considered only if the other aspects of the program, namely service, intramural, and informal extramural (play days, sports days), are not jeopardized. They have also indicated the desire to avoid the undesirable practices (over-emphasis on winning, undue publicity, public pressure, and interference with classes) that have characterized the interscholastic and intercollegiate programs for boys.

The Division of Girls and Women's Sports, a part of the American Association for Health, Physical Education, and Recreation, has established a series of guidelines to regulate competition for girls and women on the junior high school, senior high school and college levels. The high school guidelines have specific participant, leadership, and administration standards, many of which are concerned with the safety and welfare of the girls participating. The college guidelines include administration, covering such subjects as budget, scheduling, health and safety, tournaments, and leadership; and participation, covering such factors as eligibility, medical exams, length of season, and number of games. These DGWS guidelines should be used to insure safe interschool activities for girls.

Interschool activities for grade school boys

In grades one through six the program for boys should emphasize required class program with outlets for competition in an intramural

[3] Fred V. Hein. Paper delivered at National Conference on Accident Prevention in Physical Education, Athletics, and Recreation. (Washington, D.C.: American Association for Health, Physical Education, and Recreation, 1963.)

program, particularly for grades five and six. Extramural play might also be enjoyed at these grades provided it is directed by qualified leadership and adheres to the approved objectives and standards recommended for children of elementary school age. Highly competitive and highly organized programs should be avoided. State, regional, and national tournaments as well as local, charity, or exhibition games are generally not recommended for this group. If interscholastic competition is offered for grade school boys all special controls must be provided such as medical care before and during such programs, proper equipment and facilities, qualified officials, classification of players, and game adaptations; if provided, such logistical support should not be at the expense of basic physical education and recreation programs that are designed to meet needs of all boys and girls in the community at that growth and developmental level.

ACTIVITIES FOR OLDER CITIZENS

To reduce the risk of accidental injury to older citizens in sports participation, certain procedures must be followed. Most important is a health examination to determine their physical and possibly emotional fitness. Included in the examination should be a careful review of the person's health history.

Second, the activities should not require a high degree of cardiovascular endurance, muscle endurance, or muscle strength. In addition, activities of a contact nature should be avoided. Many physical activities such as golf, bowling, tennis, table tennis, badminton, archery, and hiking are suitable for older citizens. However, even in these activities moderation should be exercised. Although people in their seventies play golf, they exercise certain restraints such as not playing too many holes, utilizing aids such as golf carts and caddies, and playing at a slow pace.

Third, older citizens should attain the degree of physical conditioning needed for the sports in which they engage even though such activities are of the less strenuous type. A conditioning or training program aids in preventing injuries by hardening the body and increasing resistance to fatigue. Warm-up, which is the conditioning of the body prior to participation, has been shown to be a protection from injury.

A fourth accident preventive is the development of the skills essential to the particular activity in which one engages. This applies to young and older participants alike. All sports require varying degrees of skill in performing the movements involved. The better these movements are executed, the greater the chance for avoiding injury.

Associated with skill development is sound instruction, which includes not only knowledge of important play techniques but also the health and safety aspects of activity. The caliber of instruction should be the best, particularly in the more hazardous sports such as skiing.

The fifth consideration for avoiding injury in sports deals with equipment and facilities. Older citizens should be aware of the proper kinds of equipment and facilities which aid in protecting against injury. The equipment should be of the best quality, fit correctly, be checked periodically for defects, and be maintained according to the manufacturer's standards. Fit is particularly important as a protection against injury. For example, if a shoe is too tight, a golf club too long, or a bowling ball too heavy, an accident could occur. With regard to facilities it is important to consider factors that could reduce accidents. The most important of these are: (1) a smooth, even, nonslippery playing surface clear of all extraneous objects (broken glass, stones, pieces of wood); (2) a sufficient size play area for the activity; and (3) a system of periodic inspection and correction of defects.

SPORT MODIFICATIONS AND SAFETY

Standard sports rules are frequently modified to offer more meaningful activity programs, e.g., to accommodate involvement of atypical persons or groups; to overcome limited equipment or inadequate facilities available for a program; and to create a new twist for the sake of fun.

Evaluation of the influence of change requires more than casual attention. Preplanning for suitable modification is fundamental. Will it provide the motivation and challenge of that sport without introducing a new significant hazard or negating a previously effective injury control? Continuous evaluation along these lines should follow to detect unexpected patterns of accidental injury.

Such modifications are often made to bring the benefits of suitable sports experiences to all who could not benefit without them. Wheelchair sports as therapy for the physically handicapped and a portable swimming pool program for the inner city neighborhoods are examples. Under these circumstances, risks must be accepted in order that the benefits can be realized.

However, these risks should always be calculated risks consistent with the philosophy of sports programs. Some control must be assured without diluting unnecessarily the potential value of the sports experiences.

To determine the amount and type of control often requires consultation with authorities experienced with the problem that produced the need for modification. By *authorities* we refer to (1) the physician of the atypical person if a medical prescription for the modified activity is required; (2) physician consultation on the medical considerations involved when the needs of a particular atypical group are to be met through physical recreation; and/or (3) the consultation of educators who have studied and experienced modification of a sport for a particular purpose and who have arrived at what they feel is a good balance between sports benefits and sports risks.

Resource material on sports programs for handicapped persons is available from the following agencies:

AAHPER Programs for the Handicapped
1201 16th St., N.W.
Washington, D.C. 20036

National Wheelchair Basketball Association
Oak at Stadium Dr.
Champaign, Ill. 61820

National Wheelchair Athletic Association
(track and field, swimming, archery, table tennis, weight lifting)
40-24 62nd St.
Woodside, Long Island, N.Y. 11377

University of Illinois Rehabilitation Center
(wheelchair football, baseball, fencing, square dancing)
Dept. of Recreation and Athletics
Div. of Rehabilitation-Education Services
Champaign, Ill. 61820

American Diabetes Association
(camping for diabetics)
18 E. 48th Street
New York, N.Y. 10017

The Joseph P. Kennedy, Jr. Foundation
(physical education for the mentally retarded)
1701 K St., N.W.
Washington, D.C. 20006

SAFETY PRECAUTIONS

Because of the high toll of accidents on streets and highways, careful thought must be given to the manner in which athletic teams are transported. This includes any type of travel even if it is only to and from a practice field. Student athletes often ride with other students or with the coach with minimum consideration to driver qualification, vehicle condition and load, driving conditions, and adequate insurance. This practice is loaded with potential danger because the driver may be reckless, the vehicle defective, and driving conditions hazardous.

The more desirable method of transporting athletic teams is by school bus or public carrier because of the presence of important safety factors such as a more qualified and experienced driver, a safer and better maintained vehicle, and more adequate insurance coverage.

If a private auto is used, care should be taken to select an accident free, responsible adult driver; to select a vehicle that has been inspected and approved; to obtain adequate insurance coverage; to secure approval of school authorities; to have parent consent; and to cancel trips when driving conditions are hazardous.

Because of the unusual circumstances associated with sports participation such as showering, dressing, and being in the pool, the necessity for carefully planned, organized, and frequently practiced emergency drills, including fire drills, is very great. A clothing procedure for the gym, pool, locker and shower room, and special activity rooms should be worked out. If the weather is favorable, students in the gym and special activity rooms can carry out the drills in their gym outfits. If the weather is inclement and time permits, they should be permitted to secure outer clothing. If it is an actual fire and danger is imminent, safety precedes comfort.

For students in the pool, shower, or locker room who are scantily clad, a procedure for quickly securing clothing should be worked out and practiced during the drills. Again, if an actual fire is in progress and danger is imminent, safety precedes modesty.

Each physical education teacher should carry a roll book so that when the class reaches its assigned area, roll can be taken to assure that all students are accounted for. This can be done quickly with a prearranged buddy.

In addition to developing an efficient drill procedure, the physical education department should consider other fire prevention practices:

1. Make sure all exit doors from the gymnasium, locker room, special activity rooms, and the pool are unlocked and in working order.
2. Know the location and operation of fire extinguishers.
3. Post fire drill regulations in conspicuous places.
4. Use metal storage cabinets for hazardous items such as paint, turpentine, and acids.
5. Make sure all passages and aisles used to vacate the premises are always kept clear.
6. See that exit lights in the gymnasium are on at all times.
7. Do not permit accumulation of rubbish, junk, and other waste materials.

The use of the indoor physical education plant for activities where spectators are present requires certain precautions. One of the most important considerations at any time is the danger of fire. Fire prevention rules must be strictly enforced during the use of indoor spectator areas. Smoking, overloaded premises, insufficient or locked exit doors, and poorly marked exits increase the potential for disaster if a fire occurs.

The use of trained guards is desirable for maintaining order in case of trouble and to restrain spectators from the play area. Ushers might also be an added safety factor by facilitating the movement of persons to and from their seats.

Schools frequently enlist the assistance of the local police department to facilitate the movement of traffic to and from the games. Events also run smoother and safer when parking space is provided and teachers and/or students are used to help.

If there are beverage vendors at these events, all drinks should be dispensed in paper cups instead of bottles or cans.

References

American Association for Health, Physical Education, and Recreation. *Annual Safety Education Review.* Washington, D.C.: The Association. Annual.

Florio, A. E. and Stafford, G. T. *Safety Education.* 3d ed. New York: McGraw-Hill Book Co., 1969. 459 pp.

Seaton, D. C.; Stack, H. J.; and Loft, B. I. *Administration and Supervision of Safety Education.* New York: The Macmillan Co., 1969. 368 pp.

Stack, H. J. and Elkow, J. Duke. *Education for Safe Living.* 4th ed. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966. 374 pp.

Strasser, Marland K. et al. *Fundamentals of Safety Education.* New York: The Macmillan Co., 1964.

The Health Examination | KENNETH S. CLARKE, Ph.D.

The term *health examination* has replaced *physical examination* in signifying the physician's appraisal of a student's medical eligibility for sports and other school activities. *Physical exam* has had a limited meaning. To many, it was considered a threat to participation. To others it connoted a required ritual of recording physical test findings that would satisfy any legal inquiry into the school's efforts to prevent students with atypical physical conditions from engaging in school sponsored programs.

Conversely, *health examination* has a positive connotation and suggests a student's qualification for safe participation in a suitable activity. The aims of the health examination are listed in the AMA's *Guide for Medical Evaluation of Candidates for School Sports:*

1. Determine the health status of candidates prior to participation and competition;
2. Provide appropiate medical advice to promote optimum health and fitness;
3. Arrange for further evaluation and prompt treatment of remediable conditions;
4. Counsei the atypical candidate as to the sports or modification of sports which for him would provide suitable activity;
5. Restrict from participation those whose physical limitations present undue risk.

The health examination is considered the priority item for the welfare of candidates for sports. Is the boy capable of strenuous, all-out effort? Is he especially vulnerable to the risks inherent in a given sport? Can he defend himself adequately during play? Participation in sports involves a calculated risk, and it is the purpose of the health examination to help minimize *undue* risk.

Types of health examination

The health examination is of two types: the *periodic* health examination which is predictable (one can predict when it will occur), and the *referral* health examination which is unpredictable (it occurs when a need is recognized). A total health appraisal should be organized; this combines the information derived from periodic health examinations and teacher observation and, where indicated, with the consequences of referral examinations.

Discussion of periodic health examinations for sports must encompass the school's total health and safety program since the sports program is an extension of the entire school educational curriculum.

The periodic health examination of school age boys and girls generally occurs a minimum of four times in a student's precollege career:

1. As he enters school at kindergarten or primary level;
2. At the fourth grade or intermediate level;
3. At the seventh grade or junior high level;
4. At the tenth grade or senior high level.[1]

Beyond this index of the students' health are the skilled observations by teachers of the children they see day to day over months at a time. Any deviation from a child's norm would be evaluated by a referral exam to see if:

1. The student has an underlying illness;
2. The student has not been practicing sound health habits;
3. The student has not budgeted his time wisely;
4. A teacher, parent, and/or employer have been making undue demands on him.

However, the regulations of the school system, state laws, and the demands or hazards of certain sports are of sufficient significance beyond the scope of the customary health appraisal to justify selective use of the periodic health examination for sports.

The following list shows what one county medical society found while cooperating with the local school systems for preseason school athletic exams. Of 1,107 exams in doctors' offices, the society discovered: one congenital heart leading to surgery, two rheumatic hearts which restricted activity, six boys with only one functioning eye, one chronic genitourinary infection, three with one testicle, one kidney anomaly with hypertension, one diabetic, two hernias, one spondylolysis, two weak knee ligaments, one epileptic, and numerous lesser problems.[2]

Totals of one and two do not seem impressive statistically until one considers a national summarization of all county experiences. Conditions such as having one testicle or being an epileptic under medical control pose little problem for the student seated in a classroom. However, place this same student amid colliding bodies in a sports activity and these conditions become significant.

Scope

Knowledge of past illnesses, injuries, operations, and immunizations is necessary to ensure proper medical evaluation of a student's health. The AMA *Guide* suggests that the candidate's personal physician carry ou. the health examination since he already is familiar with the student's health history. If there is no personal physician to consult, a health history form should be completed by the candidate and parents and made available to the examining physician. A suggested form, developed by the American Medical Association Committee on the Medical Aspects of Sports, appears in Table 1.[3]

In some communities, athletes are examined individually by their family physician, school physician, or team physician. In other communities, a group procedure is utilized. The particular method of handling the examinations depends upon the customary procedures, leadership, and resources of that community. Generally, problems can be worked out satisfactorily through the school health committee of the medical society meeting with appropriate school personnel. The following considerations are basic to any arrangement:

1. Ample space in a private, quiet room with no demands for undue haste;
2. Examinations scheduled sufficiently in advance of the practice or conditioning program to allow adequate time for consultation, diagnosis, and treatment, when necessary;

[1] Joint Committee on Health Problems in Education of the National Education Association and the American Medical Association, *Suggested School Health Policies* (Chicago: American Medical Association, 1966), p. 15.

[2] School exam blues . . . roses to you, *Bulletin of the Pierce County (Washington) Medical Society* 35 (Nov. 1964), p. 26.

[3] AMA Committee on the Medical Aspects of Sports, *Guide for Medical Evaluation of Candidates for School Sports* (Chicago: American Medical Association, 1966), p. 2.

3. Health evaluation extending from the sport in question to all sports available in the community.[4]

TABLE 1

SUGGESTED SPORTS CANDIDATES' QUESTIONNAIRE

(To be completed by parents or family physician)

Name ____________________ Birth date ________

Home address ________________________________

Parents' Name ________________ Tel. No. ________

1. Has had injuries requiring medical attention	Yes No
2. Has had illness lasting more than a week	Yes No
3. Is under a physician's care now	Yes No
4. Takes medication now	Yes No
5. Wears glasses	Yes No
contact lenses	Yes No
6. Has had a surgical operation	Yes No
7. Has been in hospital (except for tonsillectomy)	Yes No
8. Do you know of any reason why this individual should not participate in all sports?	Yes No

Please explain any "Yes" answers to above questions:

____

____

____

9. Has had complete poliomyelitis immunization by inoculations (Salk) or oral vaccine (Sabin)	Yes No
10. Most recent tetanus toxoid immunization	________ date
Was this a booster?	Yes No
11. Has seen a dentist within the past 6 months	Yes No

____

Parent or Physician

Under these conditions, one thorough annual health examination for sports would be sufficient for the student. However, there are exceptions to this rule for the candidate who after the annual examination and before the onset of a new sport within the year (1) experiences a significant injury or illness; (2) undergoes surgery and/or therapy; or (3) is not under direct observation by the physical education faculty of that school for a significant period of time. Preference for an August health exam over an April-June exam for football candidates, for example, is based on the fact that these boys are not under the school's day-to-day observation during the summer.

[4] *Ibid.*

Disqualification

Some conditions observed in the routine examinations are not defined clearly or may have questionable significance. A heart condition on the record of a sports candidate is meaningless if not further evaluated. One cardiologist has listed eight types of heart conditions that could be diagnosed among youth, each with some subcategories of pathology. Yet such conditions are not necessarily contraindications for sports, depending on the severity of the condition, the sport, and the boy's response to activity.[5] Physicians now have at their disposal a simple office method for assessing a candidate's response to endurance activity.[6]

The AMA Committee on the Medical Aspects of Sports explains that for a student with a health disorder, the degree of danger in sports participation varies with the abnormality as it relates to risks, the otherwise athletic fitness of the candidate, and the nature of the supervisory control. There are three general aspects of sports to be considered when evaluating a student for safe participation: endurance, collision, and other (the noncollision, nonendurance sports). Approval for sports in one category is possible even though disqualification would be warranted in a different category. Disqualification does not strictly imply restriction from all sports or from the sports in question in the future. [Note: a boy who is medically disqualified from a varsity sport must not be permitted to participate in the intramural version of that sport unless explicit approval is received from the disqualifying physician.]

A physician should be appointed to serve as team physician for the school's sports program — varsity and intramural. This arrangement does not negate the role of the family physician.

[5] Albert Salisbury Hyman, The athlete with a cardiac problem, in *Proceedings of the Seventh National Conference on the Medical Aspects of Sports* (Chicago: American Medical Association, 1966), pp. 36-40.

[6] AMA Committee on Exercise and Physical Fitness, Is your patient fit? *Journal of the American Medical Association* 201 (July 10, 1967), pp. 131-32.

"The title *team physician* denotes a physician who is vested by the school with authority to make medical judgments relating to the participation and supervision of students in school sports. Without such a categorical designation of responsibility, there cannot exist the continuing medical assistance the athlete deserves. To put the responsibility of on-site medical decisions on the shoulders of nonmedical personnel or physicians who are removed from the scene serves no one effectively."[7]

One distinct advantage of having a team physician is uniform interpretation of health examination findings. Through close and constant contact with the athletes, the physician can acquire diagnostic insights that might complement the general health exam. Candidates for football, for example, could undergo special tests that would reveal knee stability or thigh muscular strength. Also, a team physician learns the capabilities of the supervisory controls, the resources available for his coordination, and the degree of risk associated with a sport.

Continuous appraisal

Periodic health examinations in a sports program identify candidates with health problems who should receive special consideration. Even on an annual basis, however, health examinations cannot uncover every condition that may develop as a result of the stresses of participation. The American Medical Association Committee on Exercise and Physical Fitness has stated that the coach-physical educator, with his background in the basic health sciences and because of frequent and repeated contact with his group of athletes, is in a strategic position to observe any unusual responses of the participants to the demands of the sport and training program. Thus, the coach should not become so absorbed with the skills he is teaching and the progress certain athletes are making that he neglects his responsibility to recognize conditions that merit referral for medical evaluation and diagnosis.

The AMA Committee on Exercise and Physical Fitness list reactions which may not be indicative of a health problem, but do demand medical review: excessive breathlessness, bluing of the lips, pale or clammy skin, unusual fatigue, persistent shakiness, and muscle twitching or tetany.

The AMA *Guide for Medical Evaluation of Candidates for School Sports* contains a "Suggested Health Examination Form" which was developed in conjunction with the National Federation of State High School Athletic Associations. An example of these forms appears in Table 2.

Further, a number of other complaints associated with the demands of sports may be cause for a referral exam. According to the AMA Committee, recurring or persisting patterns of any of the following, particularly when related to activity, require medical review: headache, dizziness, fainting, interrupted night's sleep, digestive upset, pain unrelated to injury, undue pounding or uneven heartbeat, and disorientation or personality changes.

Legal considerations

Schools and agencies sponsoring activity programs should require, for the protection of the athlete as well as the program, written certifications from physician and parent permitting the student to participate. Three major considerations affect the legal status of these certifications for participation.

First, no guarantee of safe participation should be implied because, simply, no guarantee can be made. Protective measures in sports are to make participation safer, but these measures cannot be expected to guarantee safety at all times.

Second, no parent can waive the legal rights of the minor child. When that child reaches age 21, the previous releases of liability are voidable.

Third, the determination of negligence of a professional person is based primarily on an interpretation as to whether he has conformed

[7] AMA Committee on the Medical Aspects of Sports, The team physician, *The Journal of School Health* 37 (Dec. 1967), pp. 498-501.

TABLE 2

SUGGESTED HEALTH EXAMINATION FORM

(Cooperatively prepared by the National Federation of State High School Athletic Associations and the Committee on Medical Aspects of Sports of the American Medical Association.) Health examination for athletes should be rendered after August 1 preceding school year concerned.

____
(Please Print) Name of Student City and School

Grade ______ Age ______ Height ______ Weight ______ Blood Pressure ______

Significant Past Illness or Injury ______

Eyes ______ R 20/ ; L 20/ ; Ears ______ Hearing R /15; L /15

Respiratory ______

Cardiovascular ______

Liver ______ Spleen ______ Herina ______

Musculoskeletal ______ Skin ______

Neurological ______ Genitalia ______

Laboratory: Urinalysis ______ Other: ______

Comments ______

Completed Immunizations: Polio ______ Date Tetanus ______ Date

Instructions for use of card Other ______

"I certify that I have on this date examined this student and that, on the basis of the examination requested by the school authorities and the student's medical history as furnished to me, I have found no reason which would make it medically inadvisable for this student to compete in supervised athletic activities, EXCEPT THOSE CROSSED OUT BELOW."

BASEBALL	FOOTBALL	ROWING	SOFTBALL	TRACK
BASKETBALL	HOCKEY	SKATING	SPEEDBALL	VOLLEYBALL
CROSS COUNTRY	GOLF	SKIING	SWIMMING	*WRESTLING
FIELD HOCKEY	GYMNASTICS	SOCCER	TENNIS	OTHERS ______

* Estimated desirable weight level: ______ pounds.

Date of Examination: ______ Signed: ______ Examining Physician ______

Physician's Address ______ Telephone ______

STUDENT PARTICIPATION AND PARENTAL APPROVAL FORM

Name of student: ______ First Last Middle Initial Name of School: ______

Date: ______ Date of Birth: ______ Place of Birth: ______

This application to compete in interscholastic athletics for the above high school is entirely voluntary on my part and is made with the understanding that I have not violated any of the eligibility rules and regulations of the State Association.

Instructions for use of card Signature of Student: ______

PARENT'S OR GUARDIAN'S PERMISSION

"I hereby give my consent for the above named student (1) to represent his school in athletic activities, except those crossed out on this form by the examining physician, provided that such athletic activities are approved by the State Association; (2) to accompany any school team of which he is a member on any of its local or out-of-town trips. I authorize the school to obtain, through a physician of its own choice, any emergency medical care that may become reasonably necessary for the student in the course of such athletic activities or such travel. I also agree not to hold the school or anyone acting in its behalf responsible for any injury occurring to the above named student in the course of such athletic activities or such travel."

Signature of Parent or Guardian: ______

Date: ______ Address: ______ (Street) ______ (City or Town)

NOTE: This form is to be filled out completely and filed in the office of the high school principal or superintendent of schools before student is allowed to practice and/or compete.

to the standards of prudent professional behavior in that community under the given circumstances. For an institution, negligence would have broader implications. In this regard, Leibee lists four elements of negligence used by the courts as criteria: "(1) Duty to conform to a standard of behavior which will not subject others to an unreasonable risk of injury; (2) Breach of that duty — failure to exercise due care; (3) A sufficiently causal connection between the conduct or behavior and the resulting injury; (4) Damage or injury resulting to the rights or interests of another."[8] Obviously, mere carelessness is not the extent of the law's consideration of negligence.

A physician's examination and consequent certification is now considered a fundamental procedure in the protection of students wishing to engage in school or community sponsored sports programs. The risk of legal liability for a physician who undertakes the medical examination, supervision, and care of members of a school athletic team parallels that of a physician in any other type of practice. In fact, few suits have arisen out of the medical supervision of school athletic teams or the treatment of injured student athletes at the scene of the injury.[9]

Parental consent for a child's participation and for emergency medical care makes it clear that the sponsoring institution's designated physician is executing an appropriate function in handling on-site athletic injuries. While the minor's right cannot legally be waived, such a release reflects the honorable intent of the school and physician in protecting the athlete and deters unwarranted future suits.

[8] Howard C. Leibee, *Tort Liability For Injuries to Pupils* (Ann Arbor, Mich.: Campus Publishers, 1965), pp. 8-9.

[9] AMA Joint Statement of the Law Department and the Committee on the Medical Aspects of Sports, Legal liability of team physicians, Unpublished Statement (Chicago: The Association, 1966).

References

AMA Committee on Exercise and Physical Fitness. Is your patient fit? *Journal of the American Medical Association* 201:117-18, July 10, 1967.

AMA Committee on the Medical Aspects of Sports. *Guide for Medical Evaluation of Candidates for School Sports.* Chicago: The Association, 1966.

———. The team physician. *The Journal of School Health* 37:497, 501, Dec. 1967.

AMA Joint Statement of the Law Department and the Committee on the Medical Aspects of Sports. Legal liability of team physicians. Unpublished statement, The Association, 1966.

Hyman, Albert Salisbury. The athlete with a cardiac problem. In *Proceedings of the Seventh National Conference on the Medical Aspects of Sports*, pp. 36, 40. Chicago: American Medical Association, 1966.

Joint Committee on Health Problems in Education of the National Education Association and the American Medical Association. *Suggested School Health Policies.* Chicago: American Medical Association, 1966.

Leibee, Howard C. *Tort Liability for Injuries to Pupils.* Ann Arbor, Michigan: Campus Publishers, 1965.

Leadership Controls

NORMAN J. JOHNSON, Ed.D.

7

There is a growing need for good leadership in sports programs. While such programs offer worthwhile benefits, they often pose significant risks to the well-being of the participant. Sound leadership must be exercised to plan and administer safety measures to preserve both the integrity of the activity and the health of the participant.

Advanced planning of a sports program in terms of leadership control should include anticipation of certain hazards related to the sports activity, facilities, environment, players, supervisory personnel, and the attitudes of the community. Consideration should also be devoted to the development of guidelines, establishment of a philosophy and objectives, determination of content, analysis of student experiences, and the means whereby exacting standards for evaluation can be established and utilized. In addition, leadership control directs the implementation of ideas, the application of principles to the current situation, and the exercise of vigilance during on-site supervision.

Leadership control includes recognition of the need for improvement in techniques of safety instruction. It also recognizes the role that other professionals and agencies play in the field of safety education. Thus, there should be mutual assistance in providing laboratory experiences, establishing the best plans for teaching, stimulating proper motivation for learning, and assuring safety measures which will reflect the best educational practices.

Leadership control involves the kind of teaching that imbues the participant with a respect for the principles of safety. The safety educated participant of today will be the most effective safety program leader of tomorrow.

SELECTION AND TRAINING OF TEACHER-LEADERS

Improvement in course offerings in our colleges and universities is urgently needed in the area of safety. Today, in many teacher training institutions, courses in first aid and safety, if offered at all, are offered primarily on an elective basis. Our colleges have an important role to play in this regard — that is, to develop a preservice program that will assure competency in teaching safety.

State departments of education and their delegated agencies can help significantly by updating certification requirements to include requirements in safety instruction. Strict policies should be instituted relative to the hiring practices of boards of education. A common example of improper hiring can be noted in the selection of some coaches. At times, coaches are employed who have little or no training in safety education, prevention and care of athletic injuries, anatomy and kinesiology, or other related subjects; but they are selected primarily on the basis of their athletic prowess and availability. This practice also exists in the hiring of personnel for playground and neighborhood recreation programs in many of our smaller towns and communities. Perhaps shortage of both funds and qualified leaders has created this situation. Yet, near most communities there are agencies such as the American Red Cross, state, county, and local health centers, industrial concerns, first aid volunteers, doctors, nurses, and many other specialists and service organizations which might be called upon to assist in the training of workers in safety procedures.

In-service training

The selection of an individual to supervise and direct the instructional program should be made with special care. His academic training and background should be comparable to that of other members of the instructional staff. His capabilities should be demonstrated not only by his academic and scholastic achievements, but also by his adaptability to meet varying situations. Personality and high moral caliber are likewise important factors to consider in selecting a leader. How well a program succeeds depends upon student response and this response is largely determined by the actions of the leader. The way in which the teacher presents himself, his understanding and interest in students, and his knowledge of the subject matter may be the dominant feature of the safety education program.

Safety is a continuous process. Well organized, in-service safety programs are essential in providing competence in safety matters among school personnel. In-service training programs may range from simple activities of reading and discussion groups, to more elaborate involvement of self-study.

Administration

In a school setting the teacher must have the full cooperation of his fellow teachers as well as the administration. The administration can assist by:

1. providing staff whose training and experience is of the highest caliber.
2. providing leadership and support in the development of instructional guidelines.
3. being available at all times to make necessary interpretations of the safety program as it relates to the total instructional program.
4. providing avenues for guidance and counseling when needed by the professional staff.
5. providing the means for determining community needs.
6. providing scheduled time for workers in the safety programs to do research, to discuss research data presented by others, or to attend professional meetings, conferences, and lectures.
7. making full use of other agencies whose purposes include safety and maintaining a close relationship with them.
8. making available adequate financing to carry on a safety program.
9. maintaining a concern for the safety program as well as problems involving safety as they develop.
10. providing the means for determining the best utilization of the school personnel in meeting the needs of a sound safety program.

Instructional staff

The instructional staff can assist the leader of the safety program by:

1. implementing safety policies and serving on committees.
2. incorporating safety information into its own areas of specialization.

3. teaching safety whenever the opportunity is presented.
4. participating actively in organizations, such as PTA's, scouting, and civic groups.

CLERICAL, MAINTENANCE, AND CUSTODIAL PERSONNEL

The clerical, maintenance, and custodial personnel can play a vital role in the area of supplementary safety instruction by:

1. providing the necessary care and maintenance of a safe environment.
2. providing specific and authorized controls when faculty personnel are not on the scene.
3. exercising good reporting practices whenever equipment and facilities appear potentially dangerous.
4. fully supporting the safety program.

TEACHING TECHNIQUES

Materials presented in courses of instruction should be selected on the basis of timeliness and of appropriateness to objectives. Before the full value of materials can be appreciated, however, the teacher should know about the psychological factors that affect learning and ask himself a number of questions. Are my students emotionally and psychologically ready for the material to be presented? Have I properly prepared them so that they can master the work and can find value in it? Am I fully aware of the individual differences that are present in the group? Are the knowledges hoped for geared to the students' age levels? Do my students have the necessary background to understand fully the information? Have I arranged the material so that the students can readily relate it to their own experiences? Can relationships to existing environmental situations be made? Is the vocabulary geared to the level of the student? Have I assured myself that instruction in the area is really worth teaching? Has my selection of material been made on the basis of priority? Does this phase of instruction relate to other past or future phases of instruction?

All units of instruction should be specifically described, and the student should have a clear idea of what is to be expected. While the teacher is important, nevertheless, learning positive safety habits and attitudes is a responsibility of all levels in the education process as well as those who function outside of the school.

ORGANIZATION OF RESOURCES FOR TEACHING

Committees are valuable for organizing safety programs and curriculum. Representation from each area of the school should be included on the committee. If a committee approach is not warranted an individual approach should be employed. Representatives from various community agencies whose functions include safety might hold full and active membership on the committee or act in an advisory capacity.

PHILOSOPHY AND OBJECTIVES

A philosophy, or statement of principles, relative to the purpose of the safety program should be established. This statement must reflect careful thought and provide guidelines for the safety education structure.

Objectives are to be clear and to the point, based on need and obtainable goals. Whether the objectives are general or specific, immediate or long range, supporting evidence must be factual and practical.

DETERMINING NEEDS

Suggestions for determining interests and safety needs of individuals include: discussions, observations, inventories, sociodrama or play acting, conferences with students and parents, checklists, questions, environmental conditions, study of accident data relative to injury and death, and contributions from various authorities and agencies. This list is by no means complete. It must be understood that many factors will affect methods used in determining an individual's needs, such as age of individual, previous experiences, geographical location, and socioeconomic background.

Motivation

The teaching and learning climate involves a partnership between the teacher as the producer and the learner as the consumer. The teacher as a leader must recognize that students are individuals — their interests, attitudes, purposes, responses, and experiences will vary. The teacher-leader must be able to identify these differences and act accordingly.

The teacher-leader must take into account several factors, namely, the needs of the students, age levels, interest patterns, and the students' abilities to comprehend the information and experiences directed toward them. In other words, teaching must be geared to the achievement level of the student.

Laboratory experiences

Safety instruction and accident control must be geared to practical and realistic situations. Too often instruction ends in the classroom rather than carrying over into the activity environment.

Safety must be learned and students must have the opportunity to apply what they learn. Training programs should be devised to give students needed safety experiences under competent adult supervision. The design of such laboratory training programs should not place the students in any danger, but should provide a meaningful way of bringing into focus the various aspects of safety knowledge learned. The activities provided in these experiences should allow opportunities for the students to make decisions, solve problems, rate themselves and others, and to express freely their own feelings about the experiences.

It is important that thorough planning and careful controls precede the actual movement of the students. Poor planning and controls may lead to poor insight on the part of the students. Also, faulty habits and attitudes might be developed which would destroy all of the good intentions of the teacher-leader. The teacher-leader is reminded that the laboratory experiences are not to be used as "playtime" because these experiences may prove the most forceful and important part of the safety instruction program.

On-site supervision, careful hazard analysis of activities involved in athletics, physical education, and recreation, hazards associated with facilities and equipment, opportunities for incidental teaching, and individual responsibility for safety to self and others are some of the many facets of laboratory experiences. Implementation must involve all groups and individuals concerned to insure coordination and understanding of the objectives which are to be accomplished. Knowledge gained should generate involvement so that it will carry over into other interests.

Teaching aids

Teaching aids should be selected on the basis of their uniqueness and utility to the teaching situations.

Aids that can be used to supplement the instructional program are:

1. audio-visual aids — movies, slide films, loop films
2. bulletin, chalk, and magnetic boards
3. demonstrations
4. experiments
5. field trips
6. phonograph and tape recorders
7. reading materials — textbooks, articles, booklets or pamphlets, and catalogues
8. records
9. special aids — charts, diagrams, photographic materials
10. television
11. speakers

EVALUATION

Efficient methods of evaluation are essential to a successful program of safety education. Froehlich says, "because a knowledge of the worth of present practices is requisite to their improvement, the . . . program must assay the worth of its activities. Evaluation is the cornerstone upon which . . . programs are built."[1]

Evaluation can provide valuable insights concerning the strengths and weaknesses of a program. Too often data revealed from evaluation instruments are stored away and the information never used. It is vitally important that persons concerned with the program, especially the students, be the recipients of all of the information available regarding the program.

Evaluation devices

The devices which follow are from Carl E. Willgoose.[2]

Observation. To the teacher with an astute eye, observation can be a most fruitful evaluation technique. Observation can yield objective information, especially if the observer is self-disciplined, critical, and precise.

Checklist and rating scales. A simple list of items to look for when appraising pupils can make the difference between a thorough, objective evaluation and one of limited value. The checklist or rating scale brings order to the observation.

Questionnaire. A series of specific questions can be listed for use in a particular health or physical education project.

Interviews. As an effective measuring device the interview falls somewhere between questionnaires and observations. It can be effective in ascertaining how students feel about a program or how they themselves feel and why.

Records. Cumulative records provide the teacher with valuable accounts of pupil behavior.

Self-testing activities. These activities are useful in helping pupils to appraise their own physical performance.

Written and oral tests. Tests are the most common means of appraising the extent of pupil knowledge. Oral tests are excellent for determining how much a pupil knows about a topic, but they are time consuming. Written tests, when properly constructed, can be used to appraise physical education skills, game knowledge and strategy, game rules, and misconceptions that contribute to danger.

Performance tests. These are individual tests and measure motor ability and sport skill. There are also tests that involve a performance which is essentially unrelated to skill; these tests measure such things as strength, endurance, flexibility, balance, and reaction time.

Pupil opinion surveys. This offers a means of identifying pupil attitudes for the purpose of improving the instructional program.

The case study. This device involves the use of comprehensive data about an individual as a basis for diagnosing and interpreting his conduct or behavior.[3]

Evaluative techniques present certain limitations. Teacher-leaders are encouraged to devise their own techniques and procedures or to use those that are readily available in the original form, in combinations, or with modifications.

A test or evaluative technique is judged for its adequacy, efficiency, and consistency as a measuring device on the basis of certain qualities such as validity, reliability, objectivity, norms, and practicability. Validity indicates the relationship of a measure or diagnosis with meaningful criteria of learning or behavior. Reliability indicates the consistency, equivalence, or stability of a measure that is obtained. Objectivity indicates the identity or similarity of the scores or diag-

[1] Clifford P. Froehlich, *Guidance Services in Smaller Schools* (New York: McGraw-Hill Book Co., 1950), p. 338

[2] Carl E. Willgoose, *Education in Health Education and Physical Education* (New York: McGraw-Hill Book Co., 1961), pp. 9-11.

[3] J. Wayne Wrightstone et al., *Evaluation in Modern Education* (New York: American Book Co., 1956), p. 37.

nosis obtained from the same data by equally competent scorers. A norm provides an average or typical value for a measure or diagnosis obtained by the administration of a measuring instrument to a specific population so that subsequent scores or measures for an individual or group may be compared with the typical values of the normative population. Practicability indicates the feasibility of a test or evaluative technique on such bases as cost, time required for administration, and ease of administration, scoring, and interpretation of the results.

Evaluation checklist

	Yes	No	Partially
1. Have I given to the members of the board of education, administration, physicians, teaching staff, and students the objectives of the safety program written in concise and understandable language?	____	____	______
2. Have I taken care of all cases and situations involving safety in a way which promotes wholesome relationships with school personnel and others concerned with safety?	____	____	______
3. Have I taken advantage of opportunities to include administrators, students, teachers, maintenance workers, and parents in the safety education program?	____	____	______
4. Are my teaching and allied programs directed toward fostering safe habits shared by school authorities, government agencies and officials, parents, and participants in the various phases of physical education, athletics, and recreation?	____	____	______
5. Have I created avenues and channels where information concerning safety can be made readily available?	____	____	______
6. Have I given attention to safety program planning for areas other than physical education, athletics, and recreation, such as band, ROTC, dramatics, laboratories, and field trips?	____	____	______
7. Have I fully utilized all available resources that would enhance my safety education program?	____	____	______
8. Have I sought help in solving difficult problem situations, making changes in programs, and planning in general?	____	____	______

	Yes	No	Partially
9. Have I accepted the responsibility of assisting other individuals and agencies with their programs?	____	____	________
10. Do I attend meetings and participate with other departments of the school and local community groups?	____	____	________
11. Are the instructions for handling emergencies clear, flexible, and adaptive to varying situations?	____	____	________
12. Are the instructions for emergencies practical and do they adequately serve the purpose for which they were designed?	____	____	________
13. Have I emphasized safety in a meaningful way? Do those concerned fully understand the purposes and objectives of the safety program?	____	____	________
14. Have I made full use of the ways to help students become more responsible to themselves and others in respect to safety?	____	____	________
15. Have I devised the means for ascertaining knowledge of safety?	____	____	________
16. Is my system of accident reporting adequate?	____	____	________
17. Are my follow-up safety procedures adequate and consistent with good practice?	____	____	________
18. Do I make available information resulting from evaluation and follow-up to all concerned?	____	____	________
19. Is full use made of the data stemming from evaluation as a means of making corrections, improvements, or as a basis of determining success?	____	____	________

References

Willgoose, Carl E. *Education in Health Education and Physical Education.* New York: McGraw-Hill Book Co., 1961.

Wrightstone, J. Wayne; Justman, Joseph; and Robbins, Irving. *Evaluation in Modern Education.* New York: American Book Co., 1956.

Facilities, Equipment and Supplies

GEORGE F. COUSINS, P.E.D.

COOPERATIVE PLANNING

A long range program of extensive study and planning is basic to the orderly development of a community's sports and recreational facilities. New facilities are planned in terms of future needs and expanded programs to help insure maximum utility.

A master plan for community expansion should include, in addition to building sites, recommended sites for out-of-doors sports and recreation. Community government, school boards, park boards, recreation boards, and other public service organizations working together with a community planner are essential to the development of a master plan for community growth.

With an acceptable master plan, construction of sports and recreational facilities will follow an orderly and systematic program of development. Such a master plan generally will locate building and outdoor sites for sports and recreation.

Specific site selection is most important to participant safety. Considerations should include traffic hazards, elevation, sanitation, orientation, state codes, accessibility, expansibility, and topographical features. Those responsible for the administration and operation of the recreational facility should be represented in the task of selecting a site. Once a specific site has been selected, a building or facility committee should be formed to include representatives from all groups planning to use the facility. The first responsibility of this committee is to formulate a statement of purpose, need, and program to serve as a guide to those involved in planning. Program and philosophy must be interpreted to the community as well as to the architect and others involved in facility construction.

One individual should be appointed as planner or coordinator of the proposed facility. This person would act as a liaison among the administration, architect, and contractors and those involved in facility use. While it would be desirable if the coordinator had some experience in facility construction, it is essential that he be thoroughly familiar with the functional aspects of program offerings. It is recommended that members of the planning committee visit similar facilities, but construction of a duplicate facility should not be considered.

Responsibility for the development of specific plans for the proposed facility falls into the hands of the planning committee. Recommendations on type of facility, primary use, suggested size, and other special considerations are developed by the planning committee for preliminary discussions with the architect. Functional relationships must be interpreted for the architect before the development of preliminary drawings. General design of a building or a sports facility is the responsibility of the architect. Since the planning committee represents those who pay for, administer, and use a structure, it must have the final decision in acceptance of the completed design.

Lighting, heating, ventilation, structural materials, and acoustics are highly technical aspects of facility construction. Employment of qualified engineers and technical consultants, while initially costly, will actually be more economical in the long run.

Development of preliminary plans should involve primarily the architect and the individual representing the coordinating committee. Once the preliminary plans have been completed, all members of the planning committee and other interested individuals should study carefully the plans from a functional standpoint. Suggestions for change or questions concerning preliminary plans should be written and discussed with the coordinator and architect. This procedure should be repeated with a second set of preliminary drawings which include changes as agreed on by the planning committee. Acceptance of preliminary drawings allows the architect to proceed with the development of detailed drawings and blueprints necessary for facility construction.

During this phase of planning, the coordinator works most carefully with the architect to help eliminate poor functional relationships of the proposed facility. Some consider this aspect of planning to be the most important in the elimination of unfortunate and costly errors.

Architectural drawings should be studied and approved by those primarily concerned with the utilization of special areas, and administrative personnel should approve those areas that are general in nature.

After the acceptance of bids and selection of a general contractor, monthly progress meetings should be held. This procedure provides an opportunity for those responsible to resolve any problems that develop during the construction phase.

When planning for construction of sports and recreational facilities, follow the suggested procedure above. Design of a facility, from a functional view, should be well conceived and implemented in order to meet the needs of the community.

INDOOR SPORTS AND RECREATIONAL FACILITIES

General building features

In addition to instructional and recreational areas of sports facilities, ancillary or service areas and bare space are necessary and important parts of the total unit. All three types of building space must be considered in terms of functional relationships for the comfort and safety of spectators and participants.

Site selection and building orientation dictate primary and secondary entrances and exits, sidewalks, service areas, and roads. A careful study of anticipated movements of individuals who will use the facility is recommended. Such a flow chart will help to plan any sports facility.

Traffic circulation

The purposes of planning for traffic circulation and control include (1) reducing congestion in corridors, stairwells, locker rooms, and spectator areas, (2) minimizing disturbances in quiet areas of a building, (3) providing for ease of building supervision, (4) enhancing safe and efficient movement of individuals using a facility, and (5) providing for future building expansion.[1]

[1] *College and University Facilities Guide* (Washington, D.C.: The Athletic Institute and American Association for Health, Physical Education, and Recreation, 1968).

Consideration must be given to the required movement of sports participants from areas within service units (locker rooms to shower rooms), between service units and activity units (shower rooms to swimming pools), between service units and general units, and between general units and spectator areas.

The interrelationships with instruction, service, activity, and spectator units necessitate careful planning in building supervision and efficient traffic circulation.

Buildings designed and constructed to minimize accident hazards should include certain features. Corridors should be well lit, of sufficient width to allow for peak traffic load, and free from all obstructions. Fire extinguishers, water fountains, telephones, and other equipment should be recessed. The minimum recommended width of any corridor is five feet. Continuous corridors that terminate at an exit or a stairwell are important in case of fire. In some buildings it may be necessary to install gates or doors to provide for security of certain parts of a building.

For slight elevation differences in floor levels, nonslip surface ramps are preferable to stairs. The rise of any ramp should not exceed one foot for every 12 feet in length.

Stairways improperly designed and placed create problems of congestion and safety that should not occur. A common mistake is making stairwells too narrow. A minimum stairway width is four feet. Two lane main stairways with a center handrail are recommended. A maximum of 16 steps is recommended with provision for a stair landing if necessary. Circular stairways are not suggested for sports facilities.

Special area relationships

For safety, hygienic, and supervisory reasons, the relationships of special areas of a building to other areas should be carefully studied. The following general relationships are suggested.

Spectator space should be separated from the decks of swimming pools and floors of activity areas. Entrances and exits to spectator areas should be from corridors or directly from out-of-doors. A sufficient number of toilet rooms located near spectator entrances should be provided for spectators and participants.

A traffic flow chart within a building will aid in the planning of area units in relation to one another. The anticipated movement of participants from out-of-doors to service areas, from service areas to instructional units, and other required movements should be studied to avoid circulation problems.

In general, activity areas should be separated from instructional and administrative units by the service units of locker and shower rooms. It is recommended that special areas of a building be designed to enable any single unit to be locked but with possible access to other units. Particular consideration should be given to use of facilities by community groups.

The functional relationships of parts of an area should be carefully studied to eliminate cross traffic, provide for supervision, minimize distractions, and meet maximum program requirements.

Building services

Heating, ventilation, sound control, lighting, and electrical service systems are, to some extent, controlled by state and local building codes. Minimum requirements or standards have been adopted for the primary purpose of public safety. While standards vary from one state to another, they do offer a starting point and tend to minimize faulty planning and false economy.

While these services are included generally in the planning, others such as disposal, communication, storage, maintenance, and custodial are apt to be overlooked by the planning group. Suggestions in planning for building services are included so that these important features are considered in the planning stages of a building program.

Heating and ventilating systems. Safe and economically efficient heating and ventilating systems are highly technical and require the professional service of a heating and ventilating engineer. Quietness, ease of maintenance and operation, flexibility of control, and capacity are important considerations of climate control. Special areas may require moisture and humidity control; swimming pools, gymnasiums, and fieldhouses require specially designed equipment. A color code for all heating and ventilating systems aids in maintenance and repair of the system.

Electrical service.[2] Standards of the national electric code of the National Board of Fire Underwriters and local and state building codes should dictate the amount and kind of installation of electrical service. Electrical planning should include provisions for possible future expansion of buildings or programs.

If possible, the power entrance should be in a specially designed room located in a part of the building accessible only to authorized personnel. All main service panels, switches, light and power panels, and meters should be located in this area.

All panels and circuits should be protected by automatic circuit breakers. Additional spare circuits should be included in the initial program. Electrical service panels located in corridors or rooms accessible to all should be capable of being locked with a flush type front.

Secondary electrical service control panels are placed in various locations of the structure convenient to those individuals responsible for opening and closing the building.

Independent circuits should be provided for each of the distinct areas of the building. Lighting and power circuits to any area are best installed as separate circuits. Program systems, communications, and fire alarm systems should all be on single independent circuits, and not in regular service conduits.

Corridor, stairway, and all night lighting should be on independent circuits, with provision for three-way switches located at the end of each corridor, at the foot and head of stairs, and near the entrance of large classrooms, gymnasiums, or swimming pools. Locating switches for night lighting on the open side of interior entrances to all facilities provides convenience for supervisors and improve building security considerably.

Lighting. Engineers are essential to the development of a satisfactory system of lighting a sports and recreational facility. Quality of light is at least as important as the amount or quantity of light. Also, repair, replacement, cleaning, and initial and overall costs are important factors in planning an efficient system.

Night lights which burn continuously are recommended for gymnasiums, swimming pools, and other areas of comparable size. Corridors, stairwells, locker rooms, and some classrooms should include provision for night lights. While operation costs increase with night lighting, the safety and security factors of this system outweigh the cost of operation. Night lights should be on a separate circuit and have single controls.

The prescribed code of the local community and the state fire code must be met in providing exit lights. All exit lights must be on a separate circuit and should clearly indicate the direction to the exterior of the building. An emergency lighting system is essential for those areas where a relatively large number of participants or spectators will assemble, in order to avoid a panic in case of lighting failure.

Protective covers or shielded lights are necessary for all activity areas. Vapor proof lights must be used in shower and locker rooms and rooms with high humidity. All lights should have some type of protective shield.

Shielded or break proof outside night lighting at entrances and other strategic locations will help guard against vandalism, rowdiness, and accidents. If natural lighting is used, it must be balanced with artificial lighting. Protective shields are necessary for natural lighting in activity areas. One of the most troublesome problems of natural lighting is sun glare, which can be eliminated.

Fire alarm. The fire alarm system must meet state and local fire law regulations, and should be approved by the underwriters laboratories. The system must be understood clearly by administrators and staff who will assist in emergency evacuation of buildings.

[2] *Ibid.*

Telephone system. Pay telephone units should be installed in sports facilities for the public's convenience. Independent telephone service is recommended for specific areas of a building which might be used when other areas are not. Local telephone companies maintain consultant services to help in planning such arrangements.

Communication systems. Public address and a system of intercommunication among parts of a building should be provided. These sound systems must be flexible in design with microphone outlets located in areas of anticipated use. An outdoor system might be needed as well.

Sound control. The importance of sound control in sports and recreational facilities is readily apparent to those involved in the administration of a sports program. Sound control requires the recommendations of an acoustical engineer.

Service areas

Locker and shower rooms, storage areas, equipment issue rooms, toilets, and custodial rooms are designed for the convenience and comfort of the participant. Since these areas are often potentially hazardous, they must be designed to eliminate or minimize features which may contribute to accidental injury. Provision should be made for clean, light, and attractive service facilities capable of being effectively maintained.

Locker rooms. No attempt is made here to consider the many types of locker rooms; general suggestions concerning desirable features of locker rooms are presented.

Ideally the locker room should be located to enable participants to pass to activity rooms without crossing public corridors. If possible, this service facility should serve both indoor and outdoor sports facilities. Preferably located above ground level, locker rooms should have a functional relationship with shower rooms, lavatories, and equipment issue rooms.

Light colors for floors, walls, ceilings, and lockers are recommended. Well lighted, colorful locker rooms will help offer a sense of cleanliness and health.

Nonslip, impervious floors are essential in most service areas. A textured ceramic type tile will help prevent accidents resulting from slipping and falling. Floors should be sloped toward drains to facilitate cleaning. Lockers should be placed on covered bases, and all junctions of walls and floors covered with impervious material similar to that used on floors. Smooth walls of moisture resistant materials which permit cleaning are recommended. Ceiling must be moisture resistant.

Benches built into locker bases are initially more costly but have the advantage of making cleaning more efficient and reducing the hazards of aisle benches.

Sight barriers should be considered for entrances and exits to locker rooms. If entrance and exit doors are used, they must be equipped with approved panic bars.

If windows are to be included they should be installed above locker height and considered a part of the ventilating system. Proper ventilation of locker and shower rooms is costly but essential.

Recessed hose bibs and key controlled electrical outlets are necessary for maintaining a sanitary condition in this area.

Shower rooms. Suggestions for walls, ceilings, and floors of locker rooms are also applicable for shower rooms. Materials used in the construction of shower rooms must be easy to clean and free of sharp corners. Noncorrosive metal is a basic requirement for shower and plumbing hardware. An adequate drainage system is important to allow for surplus water and soap to be carried away quickly. Handholds placed near shower heads help control falls.

The use of liquid soap is desirable. Whatever type of soap supply system is provided, clearly posted policies regarding the proper use of the shower room will help prevent accidents arising from horseplay. The individual bar type of system may increase the danger of falls if soap is allowed to remain on the shower room floors.

The temperature of water in showers and sinks should be automatically controlled to prevent scalding.

Toweling room. A toweling or drying room is usually included as a part of the shower room facility. All suggested policies on material and design for shower and locker rooms are necessary here, too. Towel bars or towel hooks, properly positioned, should be provided for convenience and safety.

Security

Because of their uniqueness, sports facilities include a wide variety of apparatus and equipment which require maximum security when not used in an organized program. Gymnastic apparatus such as trampolines, high bars, flying rings, and parallel bars could be considered an attractive nuisance if improperly supervised or secured. Swimming pools, weight training rooms, sauna baths, and gymnasiums must be planned with security features in mind.

Most important, security starts with a well planned lock and key system designed to control a building or any specific area within a building. Consultation with hardware and security experts will help eliminate many of the problems resulting from an inadequate system.

Again, night lighting, both inside and outside a building, is strongly recommended to help control illegal entry, vandalism, and accidents.

Provision for security guards or night watchmen should be considered. Fire alarm, intercommunication, and telephone systems play an important role in maintaining building security.

State and local codes related to the building and its use must be considered in final plans.

Activity areas

Gymnasiums. There is no attempt here to recommend gymnasium standards because of the multiple uses for which a gymnasium may be constructed. Suggestions for minimizing the potential safety hazards of a gymnasium are presented rather than detailed specifications, which are readily available in other publications.

When gymnasiums are planned for multiple use, a careful study should be made to insure that any one activity will not interfere with any other activity. This guideline seems obvious but is often overlooked.

A safety zone between court areas and between courts and walls or bleachers should be wide enough to prevent injury of participants. A minimum ceiling height of 24 feet is suggested for all multiple use gymnasiums. This minimum will accommodate all activities included in a physical education or athletic program.

Because of glare many contemporary structures do not have windows or natural lighting. If windows are to be a part of the gymnasium they should be shatterproof and translucent to eliminate direct sunlight. Skylights have not been satisfactory.

Wall areas should be free of protruding obstructions, and when special equipment is necessary, it should be recessed. Structural facing tile to a height of seven feet on lower walls has proved most satisfactory in many instances; it is smooth and easily cleaned.

According to state fire codes, the maximum number of spectators anticipated dictates the number of exits required.

Seating of spectators may be accomplished by permanent seating, roll-away bleachers, portable knockdown bleachers, or a combination of these. Whatever type of spectator seating is selected, a maximum of 20 rows of continuous seating is recommended.

A storage facility large enough to store all gymnasium equipment should be located adjacent to that area. Side horses, parallel bars, trampolines, and other equipment should not be left in an unsupervised gymnasium. A storage room with a secure lock arrangement will help to eliminate accidents caused by unauthorized use of gymnasium apparatus.

In general, activity areas require a wooden or approved synthetic type floor. Special consideration must be given to floor plates or other anchoring devices for gymnasium equipment.

Swimming pools. One of the most potentially hazardous activity areas included in facilities for sports and recreation is the swimming pool. The very nature of swimming and its environment demands that special consideration should be given to the design, features, and security of this area. A swimming pool is expensive and requires continuous maintenance and supervision. If operated improperly the pool can be a safety and health hazard.

Swimming pool design is a highly specialized and technical phase of architectural engineering. Planning for the construction of a swimming pool requires the consultant services of experts. Problems of size, humidity, depth, filtration, and spectator space figure in the construction of such a facility. Conflicting uses for the pool must be resolved by the planning committee prior to the development of detailed plans.

Rectangular pools are the most functional type. If competitive swimming is included in proposed use, the pool must be designed according to AAU or NCAA specifications.

Safety features of the swimming pool area must include the following for minimum protection of participants:

1. There should be a minimum of eight feet of deck space constructed of nonskid material around the entire pool area.
2. A minimum of 10 feet from a platform and 15 feet from a diving board is required in determining ceiling height. High boards should have a minimum distance of 10 feet between boards and between the board and the deck. A clearance of at least 15 feet for low boards and 20 feet for high boards is required in front of the boards.
3. Depth markings are necessary on sides and ends of all pools.
4. Adequate hardware to insure security of this area is an important consideration. Provision for an alarm system which indicates the presence of individuals in the pool when not supervised has been installed in many recently constructed pools.

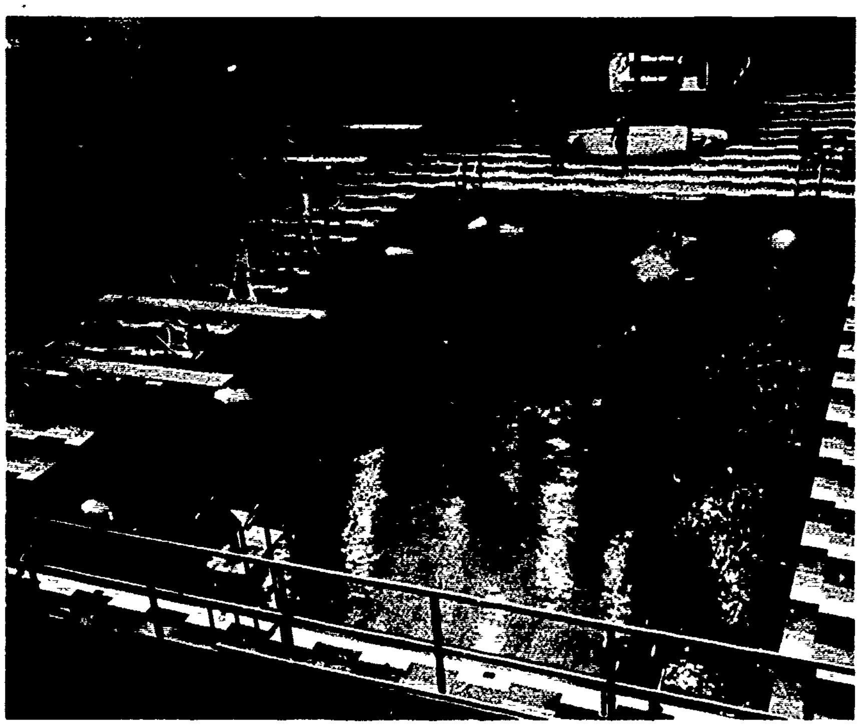

Figure 1. Special consideration should be given to the design, features, and security of the swimming and diving areas.

5. Underwater lighting and night lighting of the pool are essential.
6. Stable portable lifeguard chairs are recommended over stationary chairs. Hygienic standards must be met relative to water filtration, showers, and pool maintenance.
7. If underwater windows are installed, provision for escape should be included in case water pressure breaks windows.
8. Diving boards more than one meter should include ladders with guard rails. If a tower is used, an enclosed ladder should prevent unskilled divers from using the platform.
9. There should be handrails and guard rails in spectator areas.
10. All electrical service must include provision for grounding and consideration for the hazards of water and electricity.
11. Entrance and exits should be planned relative to shower, toilet, and locker services. Spectators should not have access to the pool deck
12. Heating, lighting, and ventilation are special problems related to the comfort and safety of participants and spectators. The services of qualified engineers in these areas of construction are necessary.
13. Storage areas are not usually considered for swimming pools but they are necessary because of the variety of activities included in pool use.
14. If scuba is to be included in the aquatic program, provision must be made for compressor and cascade systems for filling tanks.

Special activity areas

Dance studios, weight exercise rooms, gymnastic rooms, handball and squash courts, wrestling rooms, rifle ranges, and adaptive rooms are only a few of the many types of activity areas found in a modern sports structure. Each of these areas presents unique problems in size, shape, special equipment, and ceiling height. Enlisting the aid of program specialists in each area will minimize safety hazards.

The most important factor to consider in a dance studio is the floor and its finish. A hard maple floor finished in a manner that allows participants to slide and move freely without causing blisters on bare feet is recommended.

A minimum of 60 square feet per student at peak load is desirable for those rooms planned to accommodate classes in judo, wrestling, karate, and personal defense. Resilient floors and walls are essential for protection of the participant in these activities.

The floor of the weight training room is best constructed with a resilient material, durable and easily cleaned. Provision should be made for placing all weight equipment on racks or walls.

References

Engelhart, N. L.; Engelhart, N. L., Jr.; and Leggett, Stanton. *Planning Secondary School Buildings.* New York: Reinhold Publishing Corp., 1952.

Perkins, Lawrence B. and Cocking, Walter D. *Schools.* New York: Reinhold Publishing Corp., 1953.

Planning Areas and Facilities for Health, Physical Education, and Recreation. Washington, D.C.: The Athletic Institute and American Association for Health, Physical Education, and Recreation, 1965.

Scott, H. A. and Westkaemper, R. B. *From Program to Facilities in Physical Education.* New York: Harper & Row, Publishers, 1958.

The Significance of First Aid and Emergency Procedures

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9

First aid is a fundamental aspect of injury control; first aid training is compatible with a need to plan for accident prevention. While an analysis of statistics on sports injury might imply that there is no significant impact from first aid training, this is untrue. First aid training develops in individuals a high degree of sensitivity to the serious effects of injuries and instills a desire to prevent the causes of such injuries.

FIRST AID FACTORS

Because of their knowledge of the effects of injury with regard to pain, disability, financial costs, and loss of life, persons trained in first aid want to use preventive measures. Since first aid training instills this attitude, the training should be required for everyone involved in an educational leadership role.

Medical advice

The content of well developed first aid courses is established by the medical profession, since such material is an extension of medical knowledge and skill. The actions of the layman in providing emergency care must have the endorsement of the medical profession. A medical adviser is needed to plan and implement a system of injury control for organized sports programs. Formulating an emergency plan provides an opportunity to establish rapport between the layman and the medical profession. The result of a coordinated lay and medical effort to develop guidelines and perimeters of action will alleviate misunderstandings and improve care procedures. A continuing analysis of injury accident causes, effectiveness of first aid care, and follow-up medical treatment should be made to obtain information for improving safe sports participation and emergency care procedures. A scientific data bank of such information would be of significant value in establishing improved sports participation guidelines.

Participant responsibility

The great variety of sports activities, environmental elements, and differing locations creates special problems for first aid or emergency care action. The circumstances of a skiing accident, involving a very cold environment and difficult transportation of the injured person in a location far from medical care, involve a different set of problems from an accident on a football field where the physician and ambulance are on site. The problems involved with an injured hunter many miles from help, or the person on a boat suffering from a compound fracture far from shore, are more profound than those for the person with a similar injury in his home.

Some serious injuries call for immediate first aid, such as when breathing ceases, when there is a large blood loss, or when there are other life-threatening situations. In emergency first aid cases, a few minutes can mean the loss of life or permanent disability. When there is no time to seek help, first aid must be provided by the person on site if life is to be saved. The circumstances of sports participation define a need to recognize the frequency of serious injuries requiring first aid and to respond intelligently and quickly.

Leadership responsibility

Leaders in organized sports programs must be responsible for the protection of participants. Because of the frequency and severity of sports injuries, those with the responsibility must make first aid care a routine matter and not something used on an occasional basis. Analysis of injury severity often indicates that poor judgment has been made. The so-called minor accident with an estimated "slight ankle sprain" has often turned out to be a serious fracture, resulting in possible aggravation of the problem, longer disability, and even permanent damage. There is cause for concern in a situation where a neck fracture occurred but the participant was pulled off the playing field with no attention given to the critical nature of the injury. A physician will use an X-ray to determine if a fracture has occurred, yet sports leaders often pay little attention to evidence of injury and take a chance by ignoring the possible serious implications of the injury or even encouraging continued active participation. The serious effects of high humidity and high temperatures resulting in heat stroke and heat exhaustion have been well defined, yet many sports leaders show a lack of concern.

Emergency planning

All organized sports programs should have a well defined plan for responding to emergencies. The plan should be developed through consultation with persons having particular interest, competence, and experience, such as, physicians, school administrators, safety officials, police, fire departments, hospital authorities, teachers, and student leaders. The individuals responsible for implementing the plan must practice procedures at frequent intervals to insure operational competence. Mock accident injury situations, with a response to the emergency evaluated by a combined medical and sports leadership group, will help make a plan more effective.

The written plan should contain simple procedural steps to be taken by persons who assume various levels of responsibility. The system of response to an emergency should set in motion operations that will bring immediate assistance and also inform higher authorities of the existing conditions.

All accidents, illnesses, or injuries should be handled in accordance with the master plan adopted by the school administration. Telephone numbers of designated physicians, hospitals, and ambulances should be posted in places accessible to the person in charge of the activity at or away from the school or sports facility.

The plan should provide that any individual recognizing an emergency has a responsibility to report it immediately to the person in charge of the activity or area. The person in charge should carry out emergency care procedures, retaining responsibility until relieved by school or medical authority. Specific procedures should be developed for emergency evacuation, panic prevention, and the handling of emergencies at public events. Evacuation drills should be practiced in all school areas, including athletic fields, gymnasiums, swimming pools, showers, and locker rooms.

One person in each school or sports area should be responsible for obtaining medical assistance. This procedure should be clearly defined in the written operational plan, and the medical facility authority should be provided with the essential details of the type of emergency and the scope and type of assistance required. Preplanning with physicians, ambulance personnel, rescue squad, hospital, police, and fire departments should define location of facilities, entrance and exit routes, identification of responsible sports authorities, and the communication plan used by the school or sports authority. Transportation of injured or ill persons should be provided as recommended by a physician, or if a physician cannot be contacted, upon the basis of sound emergency care procedures.

If, after contacting the parent or guardian, it is decided that the injured or ill person should be sent home in a properly authorized vehicle, he should be accompanied by a representative of the school or sports authority who should remain with the individual until he is delivered to the care of a parent or guardian.

Immediate notification concerning significant emergencies must be given to school administrators or sports authority by the person in charge. As necessary, the administration should notify the parent or guardian. The release of information regarding an emergency is the responsibility of the school or sports administration only.

Records should be kept on all emergency care provided and retained as recommended by legal counsel.

Permission for a participant to return to a sports activity should be authorized by a physician and have final written approval of the school or sports administrator. A record of "permission to return" should be retained in a permanent file.

FIRST AID FACILITIES, SUPPLIES, PRACTICES

Suggested first aid items are shown in Table 1. Materials illustrating first aid practices should be posted and used as frequent references along with reviews of text materials. (See Table 2.)

TABLE 1[1]
SUGGESTED FIRST AID SUPPLIES

First Aid Item	Use
1. Sterile first aid dressing in sealed envelope 2" x 2" for small wounds	
2. Sterile first aid dressing in sealed envelope 4" x 4" for larger wounds and for compress to stop bleeding	For open wounds or dry dressings for burns; these are packaged sterile so do not try to make your own
3. Small sterile compress with adhesive attached in sealed envelopes	
4. Roller bandage 1" x 5 yds.	Finger bandage
5. Roller bandage 2" x 5 yds.	To hold dressings in place
6. Adhesive tape, roll containing assorted widths	To hold dressings in place
7. Triangular bandages	For sling; as a covering over a larger dressing
8. Mild soap	For cleaning wounds, scratches, and cuts
9. Absorbent cotton, sterilized	Swabs or pledgets for cleaning wounds
10. Applicator sticks	For making swabs
11. Tongue blades	For splinting broken fingers and stirring solutions
12. Scissors with blunt tips	For cutting bandages or clothing
13. Tweezers	To remove stingers from insect bites or to remove small splinters
14. Splints ¼" thick, 3½" wide, 12-15" long	For splinting broken arms and legs
15. Table salt	For shock — dissolve 1 teaspoon salt and ½ teaspoon
16. Baking soda	of baking soda in 1 quart of water
17. Hot water bottle with cover	Local relief of pain
18. Ice bag	Local relief of pain and to prevent or reduce swelling
	Burns
19. Tourniquet. Wide strip of cloth 20" long, and a short stick	For use in severe injuries when no other method will control bleeding
20. Eye dropper	For rinsing eyes

[1]*SOURCE: Joint Committee on Health Problems in Education of the National Education Association and the American Medical Association,* School Health Services *(Chicago: National Education Association and American Medical Association, 1964), p. 228.*

TABLE 2

FIRST AID CHART FOR ATHLETIC INJURIES

FIRST AID, the immediate and temporary care offered to the stricken athlete until the services of a physician can be obtained, minimizes the aggravation of injury and enhances the earliest possible return of the athlete to peak performance. To this end, it is strongly recommended that:

- ALL ATHLETIC PROGRAMS include prearranged procedures for obtaining emergency first aid, transportation, and medical care.
- ALL COACHES AND TRAINERS be competent in first aid techniques and procedures.
- ALL ATHLETES be properly immunized as medically recommended, especially against tetanus and polio.

Committee on the Medical Aspects of Sports
AMERICAN MEDICAL ASSOCIATION

To protect the athlete at time of injury,

FOLLOW THESE FIRST STEPS FOR FIRST AID:

STOP play immediately at first indication of possible injury or illness.

LOOK for obvious deformity or other deviation from the athlete's normal structure or motion.

LISTEN to the athlete's description of his complaint and how the injury occurred.

ACT, but move the athlete **only** after serious injury is ruled out.

EMERGENCY PHONE NUMBERS

Physician________________ Phone:________

Physician________________ Phone:________

Hospital________ Ambulance____________

Police________ Fire______ Other________

This chart in poster size is available from the AMA Department of Health Education

BONES AND JOINTS

Fracture — Never move athlete if fracture of back, neck, or skull is suspected. If athlete **can** be moved, carefully splint any possible fracture. Obtain medical care at once.

Dislocation — Support joint. Apply ice bag or cold cloths to reduce swelling, and refer to physician at once.

Bone Bruise — Apply ice bag or cold cloths and protect from further injury. If severe, refer to physician.

Broken Nose — Apply cold cloths and refer to physician.

HEAT ILLNESSES

Heat Stroke — Collapse WITH DRY WARM SKIN indicates sweating mechanism failure and rising body temperature. **THIS IS AN EMERGENCY; DELAY COULD BE FATAL.** Immediately cool athlete by the most expedient means (immersion in cool water is best method). Obtain medical care at once.

Heat Exhaustion — Weakness WITH PROFUSE SWEATING indicates state of shock due to depletion of salt and water. Place in shade with head level or lower than body. Give sips of dilute salt water, if conscious. Obtain medical care at once.

Sunburn — If severe, apply sterile gauze dressing; refer to physician.

IMPACT BLOWS

Head — If any period of dizziness, headache, incoordination, or unconsciousness occurs, disallow any further activity and obtain medical care at once. Keep athlete lying down; if unconscious, give nothing by mouth.

Teeth — Save teeth if completely removed from socket. If loosened, do not disturb; cover with sterile gauze and refer to dentist at once.

Celiac Plexus — Rest athlete on back and moisten face with cool water. Loosen clothing around waist and chest. Do nothing else except obtain medical care if needed.

Testicle — Rest athlete on back and apply ice bag or cold cloths. Obtain medical care if pain persists.

Eye — If vision is impaired, refer to physician at once. With soft tissue injury, apply ice bag or cold cloths to reduce swelling.

MUSCLES AND LIGAMENTS

Bruise — Apply ice bag or cold cloths, and rest injured muscle. Protect from further aggravation. If severe, refer to physician.

Cramp — Have opposite muscles contracted forcefully, using firm hand pressure on cramped muscle. If during hot day, give sips of dilute salt water. If recurring, refer to physician.

Strain and Sprain — Elevate injured part and apply ice bag or cold cloths. Apply pressure bandage to reduce swelling. Avoid weight bearing and obtain medical care.

OPEN WOUNDS

Heavy Bleeding — Apply sterile pressure bandage using hand pressure if necessary. Refer to physician at once.

Cut and Abrasion — Hold briefly under cold water. Then cleanse with mild soap and water. Apply sterile pad firmly until bleeding stops, then protect with more loosely applied sterile bandage. If extensive, refer to physician.

Puncture Wound — Handle same as cuts, and refer to physician.

Nosebleed — Keep athlete sitting or standing; cover nose with cold cloths. If bleeding is heavy, pinch nose and place **small** cotton pack in nostrils. If bleeding continues, refer to physician.

OTHER CONCERNS

Blisters — Keep clean with mild soap and water and protect from aggravation. If already broken, trim ragged edges with sterilized equipment. If extensive or infected, refer to physician.

Foreign Body in Eye — Do not rub. Gently touch particle with point of clean, moist cloth and wash with cold water. If unsuccessful or if pain persists, refer to physician.

Lime Burns — Wash thoroughly with water. Apply sterile gauze dressing and refer to physician.

Source: **Prepared by the AMA Committee on the Medical Aspects of Sports in cooperation with the National Athletic Trainers Association and the National Federation of State High School Athletic Associations.**

Equipment for emergency care should be placed in areas where it is readily available for use by authorized personnel, particularly in high hazard areas such as gymnasiums, playfields, swimming pools, and locker rooms.

An inventory of carefully selected emergency care supplies and equipment with their locations should be maintained in a central office. Emergency care kits including coins for phone calls should be available for supervised activities away from school or home sports area. A telephone should be near all activity areas. An emergency care facility should be provided convenient to activity areas.

LEADERSHIP

The basic ingredient for improving the injury control system for sports is trained leadership. The training plan must be developed with a recognition that our best efforts to safeguard participants cannot be totally successful. Accidents, injuries, and illness will be encountered, and sports leaders have a direct responsibility to respond with intelligence and skill.

The best defined policies and procedures will be effective only if they are carried out by persons with proper training. Sports leaders should have the ability to recognize the symptoms of injuries and illnesses, exercise judgment in providing emergency measures, and understand the limitations they have as laymen for treatment. Referral of participants to a physician should not be delayed if there is any doubt concerning the severity of the problem.

First aid should be recognized as an immediate and temporary care given to a victim of injury or illness until the services of a physician can be obtained.

All faculty and staff should receive competent instruction in first aid. Periodic refresher courses should be offered to maintain a high degree of skill in providing emergency assistance.

Persons teaching and supervising physical education, athletic, and recreation activities should have first aid competence, secured through an American National Red Cross advanced first aid course or its equivalent.

All persons designated as athletic trainers, whether students or faculty members, should have advanced first aid training as a minimum requirement and, in addition, should have further training by a physician.

In-service training, including practice of first aid procedures, should be held at scheduled intervals. First aid frequently requires a team approach, and this type of skill practice should also be conducted. The medical adviser should be involved in original training and follow-up practice sessions.

The frequency and severity of injuries and illness from sports participation and the peculiar problems created by the variety of environmental conditions place a great need for a high degree of first aid competence for sports leadership and participants.

References

American Academy of Orthopedic Surgeons. *Emergency Care and Transportation of the Sick and Injured.* Menasha, Wisc.: Banta Press, 1970.

American Association for Health, Physical Education, and Recreation. *School Safety Policies With Emphasis on Physical Education, Athletics, and Recreation.* Washington, D.C.: The Association, 1968.

First Aid Textbook. 4th ed. Washington, D.C.: American National Red Cross, 1968.

Joint Committee on Health Problems in Education. *School Health Services.* Chicago: National Education Association and American Medical Association, 1964.

Accident Investigation and Reporting | GEORGE P. SILVERWOOD, M.S.

10

The significance of accident reporting and analysis as applied to physical education and recreation can hardly be overestimated. There is a relationship between acquiring knowledge on the causes of accidents and providing an intelligent program of prevention.

A major purpose of accident reporting is to minimize injurious accidents to participants "through effective and realistic planning and through knowledgeable and well guided improvement in environment."[1] Our ability to capitalize fully upon information we collect on participant injury is certain to be reflected in improved participants' attitudes, skills, and understandings, as well as in safer physical surroundings. Use of this information to protect the school or agency and its employees against legal liability should be considered of secondary importance and, at the most, only incidental to the basic reason for the collection of accident information. This contention is supported by the fact that "value of an accident report for accident prevention diminishes in proportion to the use of the report for liability purposes."[2] A maximum of usable information is obtained when people completing the reports do not do so knowing that their statements may be used in a legal suit. Under an ideal reporting policy directed toward prevention, determination of responsibility becomes important only insofar as it contributes to preventive action.

An important facet of accident reporting is the use that can be made of this data by researchers. Findings from epidemiological injury inventories as well as well controlled, sophisticated studies of cause-effect details provide general direction to many efforts in accident prevention.

Initiation of Accident Reporting

It is fallacious to assume that statistics collected from a national sampling can be used with any degree of validity to define the accident problem in an individual program. Regardless of how similar communities may be in some respects, it does not necessarily follow that they have like patterns in accident experience. Because of this, and because of the time that has elapsed before one can review current national data, communities must collect and analyze their own information.

The initiator of a reporting system is the school board or other administrative body responsible for the policies of the program. One of the policy directives given to the program

[1] National Safety Council, *Student Accident Reporting Guidebook* (Chicago: The Council, 1966), p. iii.
[2] *Ibid.*

director should be the development of the reporting system. Procedures and particular responsibilities for recording, distribution of information, follow-up, and utilization after analysis should be periodically reviewed to ensure the most workable and effective system for that program.

Injury reporting terminology

Reporting processes are not identical for all purposes and there are differences in reporting practices among high school, college, and agency programs because of the variations in organizational responsibilities to the participant. Despite a number of minor variations, however, basic methods follow the same pattern and a single glossary may serve to clarify the terminology. These are adapted from the classic definitions relating to accidents because of the uniqueness of the injury when related to sports participation.[3]

Participant. An individual permitted by a school or agency to take part in one of its sponsored activities.

Accident. An unintended event which results in injury to a participant.

Accident, sponsor jurisdiction. An accident that occurs on the property established by the sponsor to serve the practice or competition of participants and during the period that participation is sponsor sanctioned.

Accident, nonschool jurisdiction. An accident that occurs outside the jurisdiction of the sponsor.

Accident, reportable. A sponsor-jurisdiction accident which results in an injury to a participant. Customarily, a reportable accident occurs when the injury requires first aid or medical treatment. Under this reporting plan, often no differentiation is made between "reportable" and "recordable" accidents.

Accident, recordable. A sponsor-jurisdiction accident which results in injury to a participant and deprives (or would deprive) him of medically approved complete participation in that activity on the day following injury.

Rate, frequency. This is the ratio of the number of recorded accidents to exposure, and is expressed in terms of participant-hour units. Twenty participants practicing for two hours, consequently, would constitute 40 participant hours.

Days, severity. These are the classic total lost day charges for injuries resulting in disability (impaired performance in that activity). Care must be given to include days in which the participant is still disabled following the end of that sports season.

Rate, severity. This is the ratio of the number of severity days to exposure, and expresses the result in terms of days of participation, or participant-hour units.

Injury reporting forms

Safety educators realize that no one report form will completely satisfy the needs of every system. There is, however, an essential body of information, termed basic data, which is prerequisite to the analysis of accident information. If a particular research group requires more details, another form could be used to provide supplemental data.

The basic requirement for the forms is that they be simple enough to be completed easily and in a minimum amount of time. Accident reporting instruments should be designed to minimize additional paper work.

School systems can devise and print their own reporting forms and some do with satisfactory results. This procedure has the advantage of satisfying certain local needs which are not sufficiently common to warrant space on a standard form. In general, however, school systems and colleges should refer to the standard forms for basic data used by the National Safety Council.[4] These forms were devised by committees of

[3] *Ibid.*, p. 7.

[4] National Safety Council, *Recommended Standard Student Accident Report: Form School No. 1* (1967) and *Standard Accident Injury Report: Form College No. 1* (1961) and *Form College No. 2* (1962) (Chicago: The Council).

school personnel and, over the years, have been frequently revised to update and upgrade their usefulness and simplicity.

For specific sport basic or supplemental audits, a special but standard form used by the entire league or conference is advantageous.[5] Listed below are the essential components of any system. The method of putting these factors in a simple form is a profound task and should be done by a qualified investigator in cooperation with representatives of those who are expected to fill out and utilize the information.

The essential descriptive components of a sports injury report system are:

Time-place-activity identification
Participant identification
Participant characteristics
The participant's complaint
Description of the accident
Mechanism of injury
Initial care given the injured
Medical diagnosis and disposition
Nature and day of medical clearance for return to a conditioning program
Day of medical clearance for return to complete participation.

Reporting procedures

Effective reporting requires that coaches, administrators, and clerical personnel be familiar with the mechanics and standards of reporting. A fragmentary report is of minimal value. Complete details are essential for intelligent conclusions to be drawn and applied in a program of prevention. The age and weight of the injured, the activity, the time of the mishap, the jurisdictional classification, and the related circumstances may seem trivial when each is considered separately, but they all contribute to a needed composite picture of the accident. Although the actual description of an accident is the most vital information in an accident report, this aspect is the one most frequently given scanty consideration. Too often, the person filling out the report generalizes his description in a word or short phrase such as "basketball" or "collision on playground." In the first illustration, we need to know precisely how the accident happened. Was the victim "clipped" while jumping for a ball under the basket, did he fall because of a slippery floor surface, or did he run into the bleachers? In the second instance, the reporter should tell how and why the collision occurred. Did the game areas overlap? Was this in "free play" activity? Was it the result of poor shoe traction caused by a faulty surface?

In addition to the external, physical, and environmental causes of accidents, the reporter needs to bring into perspective the behavioral reason that might lie beneath the external causes. This calls for careful preparation and analysis of individual reports.

To illustrate, let us assume that an injury on an elementary school playground is described as "rough-housing" on the accident report. This is an acceptable term for this category of accidents. Does it, however, furnish information that may be used in a positive way to correct the objectionable behavior? What were the personal or organizational factors that were *behind* the rough-housing?

A pole vaulter sustains a severe back injury by failing to notice that the sponge rubber pads have not been placed in the landing pit. The accident is charged to "inattention" on the part of the athlete and, up to now, this would be routinely accepted as an adequate explanation. A careful reporter would need to determine the reason for the victim's preoccupation.

In a third example, a basketball player fails to wear a protective shield over his eyeglasses and a collision with an opponent causes severe damage to his vision. The accident report states that the player "forgot to wear eyeglass shields" and, up to the present time, this immediate cause has served to satisfy professional curiosity. If we are to prevent similar injuries in the future, we must know why the student failed to remember the basic precaution. Vital explanations of this nature should become a part of the description on the accident reporting form.

[5] An example of a report form used in football appears in Appendix B, p. 313.

These three examples reflect use of a given report for prevention purposes. Pooling of report forms in consistent and uniform fashion can offer a pattern of insights. To avoid ambiguity in the interpretation of the nature of injuries, agree on a standard form and terminology, thereby avoiding the use of professional jargon or slang.[6] The American Medical Association has published what might be termed a dictionary of injuries resulting from various types of physical activity.[7] General use of this information would contribute substantially to the accuracy, uniformity, and effectiveness of athletic injury reporting.

Mechanics of summarization

Two procedures may be used when the volume of accident reports does not preclude hand tabulation of summaries. One is the monthly summary by individual schools or agencies and the submission of this, with the individual reports attached, to a specified coordinator. The other possibility is for each school or agency to forward only the individual report forms to a central office or coordinator whose staff draws off the information onto an overall summary. When the first method is employed, it substantially reduces the amount of work in the coordinator's office, but the time and effort is transferred to the work load of clerical personnel in the schools or agencies. Hence, the choice of methods should depend upon the availability of clerical assistance. In either event, there should be a monthly deadline for reports and, when compliance is overlooked, program directors should be reminded at once.

In large school systems and institutions of higher learning, data processing is usually employed in the tabulation and summarization of information from the individual reports. Data processing is an indispensable tool in situations which involve large quantities of statistics.[8] However, hand tabulation of report data does have one distinct advantage over mechanical computation. A person tabulating statistics manually from individual report forms almost involuntarily becomes acquainted with the circumstances surrounding each student accident. This individual necessarily absorbs a wealth of information on causation that otherwise might be overlooked.

Analysis of accident information

Following the summarization, the coordinator should compare the frequency and severity rates with those of previous years to discern general trends or radical departures from the normal pattern. If an unusual number of accidents appears in a particular category on the summary, the individual reports should be scrutinized to see if there is common factor in causation. A high incidence of falls in gymnasiums, for example, might be traced to the use of a new type of floor dressing. One college found, after noting a high incidence of contusions in football, that the new football pants were at fault; the protective pads were not positioned properly. When summaries indicate an unusual number of apparatus accidents, study of the individual reports might show equipment failure to be largely responsible and point up the need for major repair or replacement.

Athletic directors, coaches, and physical education instructors should have professional interest in analyses of the circumstances surrounding injuries in sports and physical education. They should conduct their own research programs, using the summaries to discover areas of need and to define types of individual reports which should be included in special studies. Physical educators whose background includes safety research methods are well qualified to draw valid conclusions relating to mishaps in sports and conditioning activities.

[6] Kenneth S. Clarke, The use of vernacular for sports injuries, in *Proceedings of the Eighth National Conference on the Medical Aspects of Sports* (Chicago: American Medical Association, 1967), pp. 67-71.

[7] American Medical Association, *Standard Nomenclature of Athletic Injuries* (Chicago: The Association, 1966).

[8] National Safety Council, *Student Accident Reporting Guidebook*.

Comparison of frequency and severity rates of various types of activities can be highly misleading unless man-hour exposure is projected into these statistics. The equation for determining injury frequency is the following:

$$\frac{\text{Number of Recorded Injuries} \times 1{,}000{,}000}{\text{Exposure (Number of persons} \times \text{number of hours)}} = \text{Injury Frequency Rate}$$

This formula, or at least the injury per man-hour component, can be applied to specific sports as well as overall accident situations. Use of exposure as a rate determinant presents a realistic portrayal of accident experience.

In suggesting a meaningful method of computing severity, the *Guidebook* relates "severity days" to exposure in this manner:

$$\frac{\text{Number of Severity Days} \times 100{,}000}{\text{Exposure (Average number of persons} \times \text{number of school days)}} = \text{Severity Rate}$$

Under this plan, arbitrary amounts of school absence are chargeable to accidents that result in death or permanent disability. In sports, where disability is more significant in terms of performance levels, definitions must be scrutinized to make severity rate a meaningful reflection of the injury situation.

Since the unit of exposure should be equally applicable to the overall situation and to specfic activities, consideration might be given to substituting *hours* of participation for "school days" in the preceding formula. In that event, it may be advisable to change the 100,000 index to some other multiples to arrive at a workable formula for examining the frequency rate.

Even with an eye to exposure, comparison of data from natural research of this nature with local rates and frequencies is hazardous. Because nationwide statistics, of necessity, are based upon accident summaries which are derived often from incomplete collection systems, national rates tend to be appreciably lower than those of a school system which effectively secures reports on all recordable accidents. Nonetheless comparison of local *ratios* with those of a nationwide scale is frequently valuable.

The periodic summary, then, is a device for determining trends and channeling further research. The individual report is the basic tool in pinpointing specific needs.

COMMUNICATION OF CONCLUSIONS AND RECOMMENDATIONS

Effective interpretation and dissemination of the results of accident studies to staff personnel present a realistic problem to those concerned with analysis of this information. This is one of the most essential aspects of the safety education program; however, the presentation should be so handled that administrators, program supervisors, and maintenance people are made thoroughly aware of current needs and clearly understand their responsibilities in injury control. Parents, too, should be made aware of the ways in which they can contribute to safeguarding their children against accidents. This can be accomplished by releases to the news media and by informational bulletins which go into the homes.

Coordinators and others preparing explanatory materials on accident experience should remember that what interests them as safety specialists will not necessarily strike a spark of equal intensity in the teacher, administrator, or school custodian. Bulletins of this nature should contain a minimum of statistical data. Although the report should be documented to achieve credibility and emphasis, overuse of statistics will reduce reader appeal. Safety bulletin content should be light and readable yet clearly portray the needs in the areas of behavior modification and elimination of environmental hazards.

It is well to consider existing interests when developing a publication of this type. Most coaches are naturally concerned about the kinds of accidents that are most likely to occur to their participants. They want information on how a particular practice contributes to the accident picture of the sport for which they are responsible. Coaches want to know how they can incorporate safety practices, develop proper attitudes, knowledges, and skills to help their students avoid accidents while not reducing the students' enthusiasm for the sport. Keeping participant enthusiasm means including such items as suggestions for integrating safety instruction with strategy and technique. In the classroom, the popular evaluation of the athlete can be utilized for special class projects in accident prevention, discussions designed to encourage the development of proper attitudes, and suggestions relative to the teaching of safety skills.

Understandably, coaches are eager to know if their efforts in accident prevention are reflected in an improvement in accident frequency. Progress reports which compare past accident experience with present statistics should be included periodically.

The accident bulletin should exploit the natural concern that physical educators and coaches have by including information designed to reveal significant accident prevention needs in their areas. Severity rates attached to injuries in various sports and games are helpful. A breakdown of injuries according to type and part of the body involved is of particular interest, as is a portrayal of the comparative frequency of accidents in organized games and "free play" activities on elementary school playgrounds. Many physical education specialists might find real value in a comparison of the accident frequencies of winter sports at supervised and unsupervised locations. So many aspects of accident information are of direct concern to the physical educator that little difficulty should be experienced in gaining his professional interest.

Cooperation with other fact-finding organizations

The submission of elementary and high school annual accident summaries to the National Safety Council contributes a more realistic picture of the nation's student accident experience. This organization carries on continuing studies of nationwide trends and uses the data as a basis for determining fundamental needs in child accident prevention. Its findings are made available to schools throughout the country in bulletins published by its school and college department and in *Accidents Facts*,[9] an annual publication of statistical facts about accidents of all types.

The value that can stem from cooperative reporting efforts was demonstrated by a pilot project of the American College Health Association and the National Safety Council. The program was a study of student accidents at nine institutions of higher learning as reported to health services.[10] The findings, though limited because of the relatively small scope of the study, revealed that this type of accident reporting and analysis could be of significant value on a continuing basis. Since the pilot program, increasing numbers of colleges and universities have begun to collect and study information on student and employee accidents. Outside of school related activities, programs falling under the aegis of a state-national organization should faithfully adhere to their respective reporting systems. The advantage is a controllable uniform program for data that is meaningful to both contributor and receiver with more precision in identifying local and national trends. The following organizations are repre-

[9] National Safety Council, *Accident Facts* (Chicago: The Council), an annual publication.

[10] American College Health Association and the National Safety Council, *Safety Monograph No. 3: Survey of Accidents to College Students* (1955) and *Safety Monograph No. 5: Accidents to College Students* (1956) (Chicago: The Council).

sentative of those currently assisting the sports injury data collection process.

American Camping Association
Bradford Woods
Martinsville, Ind. 46151

Boy Scouts of America
New Brunswick, N.J. 08903

Little League Baseball, Inc.
Williamsport, Penn. 17701

The National Collegiate Athletic Association
1221 Baltimore Ave.
Kansas City, Mo. 64105

National Federation of
State High School Athletic Association
7 S. Dearborn St.
Chicago, Ill. 60603

National Ski Patrol Systems
828 17th St.
Denver, Colo. 80202

References

It's more than a report. In *Safety Education*, pp. 25-28. Chicago: National Safety Council, March 1965.

National Safety Council. *National Safety Congress Transactions — School and College Safety*. Chicago: The Council, 1965. 120 pp.

———. *Student Accident Reporting Guidebook*. Chicago: The Council, 1966. 34 pp.

Proetsch, Jean L. Accident reporting — Fact or fantasy. *Safety* 8:9-11, no. 5, Dec. 1967.

Silverwood, George P. Report all, repeat none. In *Safety Education*, pp. 7-8. Chicago: National Safety Council, Febr. 1960.

Strasser, Marland K. et al. Organization and administration of the school safety program. In *Safety Education*, pp. 117-35. New York: The Macmillan Co., 1964.

Subcommittee on Classification of Sports Injuries, Committee on the Medical Aspects of Sports, American Medical Association. *Standard Nomenclature of Athletic Injuries*. Chicago: The Association, 1966. 157 pp.

Legal Liability | BERNARD I. LOFT, H.S.D.

11

Accident and injury prevention in sports must include due consideration for legal liability. The possibility of being sued by injured pupils for an act of contributory negligence should be a concern of all school employees. School administrators have a major role in preventing accidents in all areas of the buildings and grounds.

If contributory negligence in the performance of duties with school pupils can be assessed, the school employee is legally responsible for the injuries. Compensation from personal funds will be required unless the school employee is in a state where the school district as a employer is legally obligated to reimburse him for financial loss or the district is liable for alleged employee negligence. A pupil can always make an effort to claim redress from the individual charged with contributing negligence. This employee may be a teacher, an administrator, school bus driver, another pupil, or any employee of the school district. If the case is settled in favor of the student he may get a money judgment, but actual payment may not be possible if the individual sued lacks the necessary financial resources. A pupil sustaining injuries has a better possibility of satisfying his judgment if his state permits or requires school districts to protect school employees against having to make payments out of personal funds.

Payment for school accidents

Let us now consider the problem of legal liability from the standpoint of a pupil sustaining injuries in the school program. By law the child is required to attend school, to be in a designated building, whether or not all of the safety requirements have been met, and to participate in programs of physical education whether or not the facilities are desirable. Let us assume that a child is seriously injured through no fault of his own and not because of negligence by the teacher, the school system, or another student. Two pertinent questions need to be answered in such a case: why couldn't the accident have been prevented and who will pay for all of the expense?

Schools are placed in a precarious public position when accidents and resulting damage court suits must be resolved. In numerous other aspects of the school's function, administrative personnel and teachers are regarded as competent professionals whose expertise equips them to cope with problems arising in the school. In an accident occurrence, however, a jury of laymen will be responsible for a decision as to where legal liability will be assessed. Determination of where there was fault will not be decided by professional educators nor on the established standards of teacher-training institutions, but by a citizens' jury adhering to customs, mores, and beliefs. In determining negligence the jury will decide whether professional educators and the school are performing their duties in an efficient manner or are incompetent in the conduct of the school program.[1]

NEGLIGENCE

The key to teacher liability will be located in that aspect of the law related to negligence. What is negligence?

Definition

The school and its staff owe their pupils the legal duty of exercising care to prevent injuries to them. Negligence results from the breach of this duty. *Negligence is the failure to act as a reasonably prudent person would act under the particular circumstances.* Suppose we consider each component part of this principle of law:

1. *"failure to act"* — Negligence can consist of inaction as well as of action. If one fails to do something expected of him by the law, he can be negligent. Likewise, actively doing something contrary to what the law expects can also be negligence.
2. *"a reasonably prudent person"* — This is a mythical person established by the law; "foresight" is his major characteristic. If a reasonable man of ordinary prudence could have, or should have, *foreseen* the harmful consequences of his behavior, it is negligent to fail to take the necessary precautionary steps to obviate or prevent such harmful consequences. Thus, negligence is the failure to avoid trouble that reasonably could or should have been foreseen. Need one have been able to anticipate *the* particular accident that actually occurred? No, it is enough if reasonable prudence could or should have foreseen that *some such* accident might happen in the absence of precautionary safeguards. A liability law suit presents this critical question: Could or should the teacher, in the exercise of reasonable prudence and foresight, have anticipated danger or hurt to another under the particular circumstances? If the answer is yes, the teacher is negligent if he failed to act so as to avoid such foreseeable danger or harm. In other words, if in the reasonable exercise of care one could or should anticipate trouble under the circumstances before him, his failure to take precautionary measures is imprudent and therefore negligent.
3. *"under the particular circumstances"* — The specific facts in a case are all-important in the determination of negligence. What would be prudent with high school students may be highly imprudent with kindergartners. What may be prudent for a teacher assigned to a playground may be no test of the prudence of a principal who fails to assign enough teachers to supervise that playground. Even partially different facts may change the situation, as for example whether the players sent by the football coach into scrimmage are trained or untrained. In other words, in legal language, negligence is a question of fact for the jury to decide.[2]

Specific cases

With an understanding and analysis of negligence, let us now consider several cases on record to determine how the law applies in actual practice. The following are cited by Attorney Rosenfield that are examples of problems that confront educators in the field of physical education and recreation.

[1] Harry N. Rosenfield, Legal Liability for School Accidents. Paper addressed at National Conference on Accident Prevention in Physical Education, Athletics, and Recreation at Washington, D.C., Dec. 7, 1963.
[2] *Ibid.*

Case 1. A school building contained a gymnasium 80 ft. x 43 ft. with eight adjoining basketball courts squeezed into this limited space. A schedule was arranged providing for all eight courts to be in use simultaneously. An injury occurred to a participant. The court held this to be negligence because the school should have anticipated injury in an overcrowded gymnasium facility where a strenuous game was taking place involving considerable movement by the participants.[3]

Case 2. Several games of handball were scheduled concurrently on a gymnasium floor and a participant received an eye injury from being struck by a ball. No negligence was established by the court because the activity was classified as being not an inherently dangerous game.[4]

Case 3. A candidate for a teaching position was required to comply with a physical examination. During the examination she was directed to bat a softball and run to first base in the gymnasium. Because the sack that was used as a base was improperly anchored to the floor, it gave way from under the runner. The court's decision was negligence.[5]

Case 4. In New York a seven-year-old youngster was hit in the face by a baseball bat swung by an older participant during a softball game on the school's playground. The court held that there had been negligent failure to assign proper supervision.[6]

Case 5. Failure to make available supervision where children are waiting after school for the school bus and to establish regulations for the use of bicycles on the school grounds was classified as negligence on the part of a school board.[7]

Case 6. In a scheduled high school gymnasium period a student was assaulted by three other students on the school playground. There were approximately 250 students present, several of whom had reputations as being troublesome. The jury assessed negligence in this case because it should have been anticipated that such behavior was reasonably foreseeable and proper supervision might have prevented the situation.[8] This case firmly establishes that merely providing for supervision is insufficient. The *quality* of supervision is essentially important in compliance with the "reasonable man" test.

Case 7. Related to Case 6 is an earlier case in the same state involving a student assault by a classmate while the teacher was positioned outside the door directing the class into the room. In this case the court found no negligence because there was no apparent need for closer supervision.[9] The case facts revealed a difference in what the reasonably prudent person should have done under the existing circumstances that were involved in the cases.

Transportation of Participants to Athletic Events

In transporting students to school sponsored athletic contests it is highly recommended that school district-owned motor vehicles or public service commission licensed carriers be employed. Private transportation is undesirable and should be discouraged. If private transportation must be used the following recommendations should be given priority.[10]

1. Drivers should be carefully selected with a record of outstanding driving ability.
2. There should be complete and adequate insurance coverage on the vehicle.
3. It should be known whether the passengers in each vehicle are "guests" or not.

[3] *Bauer v. Board of Education,* 285 App. Div. 1148, 140 N.Y. Supp. 2d 167 (1955).

[4] *Wright v. San Bernardino High School District,* 121 Cal. App. Bd. 342, 263 2d 25 (1953).

[5] *Bard v. Board of Education,* 140 N.Y. Supp. 2d 850 (1955).

[6] *Germond v. Board of Education,* 10 App. Div. 2d 139, 197 N.Y. Supp. 2d 548 (1960).

[7] *Salleck v. Board of Education,* 276 App. Div. 263, 94 N.Y. Supp. 2d 318 (1949).

[8] *Silverman v. Board of Education,* 15 App. Div. 2d 810, 225 N.Y. Supp. 2d 77 (1962).

[9] *Bertola v. Board of Education,* 1 App. Div. 2d 973, 150 N.Y. Supp. 2d 831 (1956).

[10] Howard C. Leibee, *Tort Liability For Injuries To Pupils* (Ann Arbor: Campus Publishers, 1965).

4. If a student is assigned to drive, a responsible adult should be in the vehicle.
5. Complete instructions should be provided for the trip such as driving speed, time schedules, routes, and meeting places.
6. The vehicle should be checked for mechanical efficiency and compliance with safety measures.

Compensation for pupil injury and insurance

Adequate insurance coverage is necessary to help injured pupils obtain compensation for medical expenditures and pecuniary damages for bodily injuries resulting from school accidents. This coverage will protect school personnel from financial payments when liability related to their personal negligence is set forth in cases involving pupil injury. Stipulations established by statutory provisions in the states determine the types of insurance that school districts may or must carry, kinds of hazards to be insured against, and the financial limits of the coverage. There is a differentiation between two types of insurance that should be made available in accident and liability coverage.[11]

Accident insurance. Regardless of the assessment of fault, payment will be made by the insurance company. The terms contained in the accident insurance policy may establish pupil protection while being transported to and from the school building while in school attendance, or during participation in activities sponsored by the school in either a curricular or extracurricular function. The value of accident insurance is that compensation is made available to the injured because an accident has occurred and not because of the charged negligence on the part of the insured.

Liability insurance. Payments received by the injured will be determined by the negligent acts of the person insured. This would take into consideration negligence by the school district or employed personnel. In this form of insurance no payments are made for injuries other than in cases of negligence or various types of wrongful acts.

[11] National Commission on Safety Education, *Who Is Liable For Pupil Injuries?* (Washington, D.C.: National Education Association, 1963).

References

Bard v. Board of Education, 140 N.Y. Supp. 2d 850 (1955).

Bauer v. Board of Education, 285 App. Div. 1148, 140 N.Y. Supp. 2d 167 (1955).

Bertola v. Board of Education, 1 App. Div. 2d 973, 150 N.Y. Supp. 2d 831 (1956).

Germond v. Board of Education, 10 App. Div. 2d 139, 197 N.Y. Supp. 2d 548 (1960).

Leibee, Howard C. *Tort Liability For Injuries To Pupils.* Ann Arbor: Campus Publishers, 1965.

National Commission on Safety Education. *Who Is Liable For Pupil Injuries?* Washington, D.C.: National Education Association, 1963.

National Safety Council. *Accident Facts.* Chicago: The Council. Annual.

Salleck v. Board of Education, 276 App. Div. 263, 94 N.Y. Supp. 2d 318 (1949).

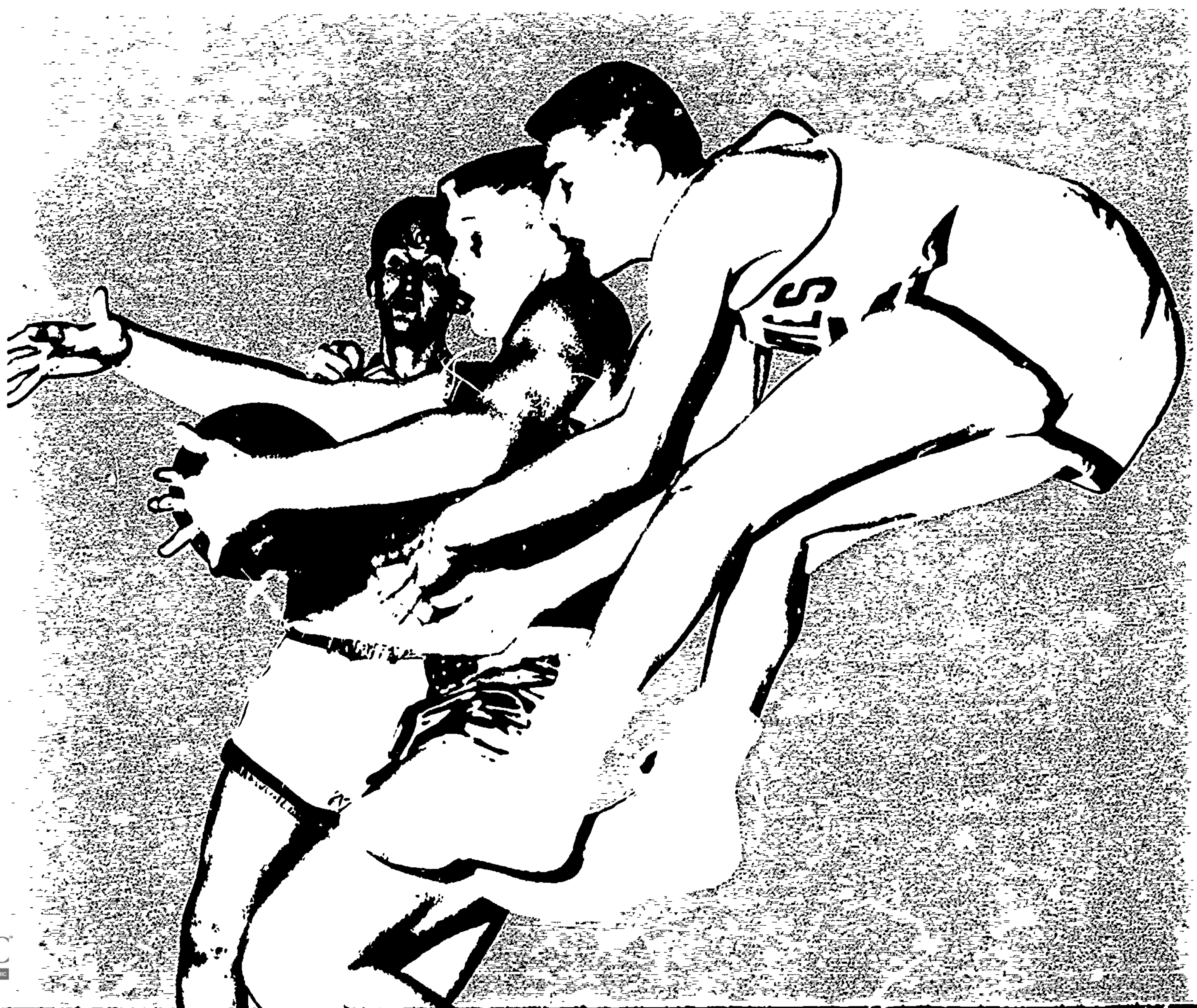
Silverman v. Board of Education, 15 App. Div. 2d 810, 225 N.Y. Supp. 2d 77 (1962).

Wright v. San Bernardino High School District, 121 Cal. App. Bd. 342, 263 2d 25 (1953).

SAFETY IN SPECIFIC ACTIVITIES

PART III

SAFETY IN TEAM SPORTS



Baseball and Softball | WARREN J. HUFFMAN, Ed.D.

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Very few deaths to either players or spectators have resulted directly from baseball or softball. However, serious and minor injuries occur each year to thousands of players, especially among younger and beginning players.[1] Injuries each year curtail either temporarily or permanently the sports careers of baseball players from the little leagues to the major leagues.

Ryan stated that "the hazards in the games of baseball and softball can be divided into five groups: running, body contact, risk from both the bat and the ball, the barriers which enclose the spectators, and hard throwing and swinging motions."[2]

Polk surveyed professional and college baseball teams throughout the country concerning the frequency and causes of baseball injuries. He noted that five types of injuries account for 82.5% of all injuries. They are, in order and percentage of occurrence, sprains 27.3%; strains 18.7%; contusions 16.9%; pulled muscles 11.3%; and fractures 8.3%.[3]

Polk found that:

> Sliding and running between bases were the primary causes of sprains. The strain was predominately caused by throwing, followed by running between bases. A contusion injury was caused by the batter being hit by a pitched ball, followed closely by collisions between players. The pulled muscle injury was caused primarily by players running between bases, followed by throwing the baseball. Finally, the fracture was caused equally by sliding, and the batter being hit by a pitched ball.[4]

Many of the injuries in softball and baseball can be reduced to a minimum by properly conditioning the players, teaching the correct execution of skills, providing suitable equipment and facilities, and adequately supervising both the players and spectators.

Conditioning

Baseball and softball are unique in that only three individuals are actively involved in every pitch — the pitcher, catcher, and batter. While it is true that all the other players should be alert on each pitch and a few may be involved, the majority of players will not participate in most plays. This is particularly true of out-

[1] Mickey Owen, Play it safe, *School Safety* 2 (March-Apr. 1967), p. 4.

[2] Allan J. Ryan, *Medical Care of the Athlete* (New York: McGraw-Hill Book Co., 1962), p. 254.

[3] Ronald G. Polk, The frequency and causes of baseball injuries, *The Athletic Journal* 49 (Nov. 1968), pp. 19-20.

[4] *Ibid.*, p. 53.

fielders, who may only be called upon once in a game to catch and/or throw the ball.

Eberhardt states: "As a conditioner, the game of baseball does not provide the activity necessary to develop a player physically in order to meet the special emergencies which arise during a game. This is why the baseball player should supplement his actual game experience with special conditioning exercises." [5] Dr. Bauman of the St. Louis Cardinals corroborates Eberhardt's statement: "We often find that the batting, fielding, and throwing work are not sufficient to gain proper conditioning. Where greater demands are made, a player needs additional strength, power, and endurance for peak performance." [6]

Since speed, agility, and coordination are key ingredients for success in baseball or softball it is important that the body and particularly the arms and legs be kept in shape. During off season, jogging and running, stretching exercises, twisting, bending, and sports such as handball are recommended. Before and during the season it is important that players continue running, particularly wind sprints, and stretching exercises.

Each player should warm up properly for running or throwing before trying quick starts or throwing hard. During the game every player must use each opportunity to keep his muscles warm and supple for the moment when extra effort is required.

The batter should run out every play, even the so-called "sure-out." Players should hustle to their positions every inning. It is customary for infielders to practice fielding and throwing each inning when they take the field and for the pitcher and catcher to take their warm-up tosses. It is equally important that the outfielders take a few practice throws, particularly on cool or cold days. Batters should take a few practice swings before stepping into the batter's box.

Because both the baseball and the softball pitcher throws the ball in an unnatural way,[7] it is extremely important that they be well conditioned and properly warmed up before pitching. "A pitcher should take special care of his arm when he is not using it. He should always keep it warm and well protected from cool or cold air, especially after he has finished pitching." [8]

Coaches and managers must resist the temptation to overwork their star pitchers. However, each year this happens at every level of baseball. The player's welfare must be the prime consideration of the coach or manager. Another precaution to the coach or manager is that before embarking on a weight training program experts should be consulted. According to Dr. Bauman:

> We discourage our pitchers from squeezing the rubber ball because then they develop muscles of the flexor group. When the forearm is extended to throw, something has to give. Now, these muscles have been made too strong, and usually, they tear around the upper epicondyle where they have their origin. The pitcher finishes with a bad elbow, or sometimes even tears a piece of bone. Therefore, exercises should be done under supervision.[9]

Skills

According to Mickey McConnell:

> It is possible to perfect baseball skills and at the same time to avoid injury. In fact the possession of skills helps to prevent accidents. Very seldom do we hear of a player who executes a play properly being injured. The man who knows how to throw, and uses this knowledge in throwing, doesn't pull a muscle in his arm, and the fellow who knows how to slide and uses this knowledge doesn't sprain an ankle or strain an elbow. It is important

[5] Don Weiskopf, St. Louis Cardinals' conditioning program, *The Athletic Journal* 49 (Dec. 1968), p. 10.
[6] *Ibid.*, p. 11.

[7] Ryan, *op. cit.*, p. 254.
[8] Buddy Taylor, Taking care of the pitcher's arm, *The Athletic Journal* 49 (Nov. 1968), p. 10.
[9] Weiskopf, *op. cit.*, pp. 66-67.

that every player concentrate on the basic fundamentals.[10]

Catching

The catcher is one of the most likely players to be injured, particularly on his bare hand. If a player learns early how to hold his hands he will seldom be hurt. Listed below are safety techniques for the catcher by Elston Howard: [11]

1. Place the forefinger of the glove hand outside the mitt or use sponge rubber inside to ease the impact of the ball.
2. Hold the rim of the glove with the bare hand or keep the bare hand folded and not clinched until the ball is in the mitt.
3. Keep in front of the ball. Shift body with a quick shuffle or hop rather than move the glove; never use a crossover step.
4. Catch close enough to batter without letting glove interfere with bat and also avoid being hit in back of head.
5. Get mask off in a hurry to spot the ball on pop flies. The catcher should not throw the mask until ball is spotted, then he should throw it away from the ball.
6. Teammates should give instructions concerning the proximity of barriers, obstructions, dugouts, and other hazards while catcher is chasing a fly ball.

Pitching

Pitching styles vary considerably but the young pitcher should try to perfect a smooth delivery that will not put undue strain on his arm. Regardless of the level of the sport, the pitcher is in the most vulnerable position to line drives. He should finish his pitching motion and immediately be in position to receive a line drive. Particular attention should be paid to the batting practice pitcher since many balls are hit back through the box, particularly by players of high school age or younger.

[10] Mickey McConnell, *How To Play Little League Baseball* (New York: The Ronald Press Co., 1960), p. 10.
[11] Elston Howard, *Catching* (New York: The Viking Press, 1966), pp. 4-9.

First baseman

When the first baseman prepares to receive throws from other infielders, he should place his foot on the inside corner of the bag, giving most of the bag to the runner. This will help avoid getting stepped on by the runner and keep him clear of the baseline, thereby reducing the possibility of a collision and a broken arm. If he is pulled off the bag and has to tag the runner coming into the bag, the tagging arm should be relaxed to avoid injury.

Infielders

Infielders should straddle or stand slightly behind the bag in receiving a throw from another player for tagging out the runner. If the runner is sliding, the infielder can avoid a collision by placing the ball in the glove, putting it in the runner's path, and letting the runner tag himself out.

On double play tries by either the shortstop or second baseman more intricate footwork is necessary. The important thing is to make sure that the first runner is out and then to move off the bag to avoid the runner coming into the base before making the throw to first base.

In fielding ground balls the infielder should stay close to the ground, keep his eyes on the ball until he fields it, and remember to play the ball and not let the ball play him. "Turning the head only gives the ball a better chance to hit the fielder in the face if the ball takes a bad hop." [12]

Outfielders

One of the major dangers of playing the outfield is that of collision with the fence, with other outfielders, or with infielders. There are several factors that determine where an outfielder should play. Generally, the distance he plays from the fence will depend upon his ability to go back to the fence for balls hit over his head. "To avoid crashing into the fence, fielder

[12] McConnell, *op. cit.*, p. 35.

first hurries to get to the fence. Then he quickly turns around to relocate the fly ball and catch it." [13]

The outfield must work together as a unit. The centerfielder is the key man in the unit and should handle any ball he can get unless another outfielder is in a better position. The player who is going to take the ball should call loud and clear for all fly balls. The other fielders should immediately reply loudly for him to take it. Extreme care should be taken on line drives hit between the fielders since it is difficult to tell who should attempt the catch. Experience in playing together should minimize the danger of such collisions. Fly balls that are hit between the infielders and outfielders should be taken by the outfielders whenever possible. The practice of hitting fungo flies during practice and allowing more than one player to attempt to catch the fly ball at the same time is a common practice by inexperienced coaches and should be discouraged because of its danger as well as the bad habits it engenders.

Both Litwhiler and Weiskopf discourage shoestring catches except when it means the winning run may score if the catch is not made. After such a catch the fielder should relax and roll with the fall.[14,15]

On sunny days all fielders should wear sunglasses. The glove can also be used to shield the eyes from the sun.

Batters

While there is no particular batting style recommended "each batter should be in his proper stance and ready to hit at the time the pitche.. delivery is to be made. Great batters . . . are never lax at this point. Prior to the delivery, however, they are completely relaxed from head to toe." [16]

[13] Owen, *op. cit.*, p. 6.

[14] Jack Coombs, *Baseball*, revised by D. Litwhiler, 4th ed. (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967), p. 92.

[15] Don Weiskopf, *Baseball. The Major League Way* (New York: The Ronald Press Co., 1962). p. 204.

[16] Coombs, *op. cit.*, p. 107.

It is important that the hitter take a comfortable on-balance stance and keep his eye on the ball This should enable him to avoid being hit by a pitch thrown at him. Since helmets are now required they should be worn at all times while batting, whether in practice or in a game. The helmet should be of good quality and in excellent condition.

Bunting the ball is a specialized form of batting and has different purposes, such as sacrificing a runner to the next base or bunting for a base hit. The inexperienced player finds it best to square around facing the pitcher, sliding his top hand almost up to the trademark of the bat. As the player becomes more experienced he can delay his squaring around, particularly when bunting for a base hit. Two things must be kept in mind: (1) when he is squared around he is more vulnerable to being hit by the pitched ball and (2) the fingers of his top hand must be placed in such a manner as not to be hit by the ball when it makes contact with the bat.

Some players are notorious "bat throwers." While this is sometimes accidental, the practice should be discouraged early in the player's career. One method might be to declare the batter out for throwing the bat regardless of the outcome of the play. Since this penalizes the player's team, pressure from teammates can be an effective deterrent.

Base running

Quick starting, speed in running the bases, ar ' ability to slide properly are fundamental. As .licated earlier, the player must be properly conditioned in order not to pull muscles with quick starts. He must be taught to look where he is running and depend upon the coaches for instructions except when the ball is in his line of vision.

In running out batted balls to first base where a turn is not going to be made, the runner should run straight ahead touching the front edge of the bag with the toe. Most authorities recommend sliding into first base only when attempting to avoid a tag by the first baseman who has been pulled off the bag by a wide throw.

Since the bases are laid out in the form of a square, it is recommended that they be run that way and not in big loops whenever a base is to be rounded.[17] Regardless of which foot touches the base (preferably the left), the runner should concentrate on touching the inside of the base and pivoting toward the next base.

Players should be taught the proper techniques of sliding as early as little league age. Most authorities advocate feet first sliding except under special circumstances because the risk of danger to the head, arms, or hands is great in sliding head first. The most important thing to remember is that once the player decides to slide he should complete his slide. "More sprained ankles, broken legs, and other injuries are inflicted on base runners by this mental lapse than by any other playing action."[18] Another rule is that the lead man on attempted double plays should slide to avoid being hit by the throw.

The first and third base coaches as well as the on-deck batter are essential to the success and safety of the base runner. The base runner is dependent upon them for signals regarding whether to slide, to stay up, to continue running, and the direction in which to slide. In addition, the on-deck batter has the responsibility of removing a bat or catcher's mask lying along the third base line.[19]

[17] John O. Herbold II, *Illustrated Guide to Championship Baseball* (West Nyack, N.Y.: Parker Publishing Co., Inc., 1968), p. 236.

[18] Coombs, *op. cit.*, p. 122.

[19] Harvey Kuenn and James Smilgoff, *Big League Batting Secrets* (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1958), pp. 187-88.

Provision of proper equipment and facilities

The furnishing of proper equipment and facilities for baseball or softball is the moral if not the legal duty of those responsible for the activities. The players must not only be furnished with proper equipment but also taught how to use and care for it properly. Excellent general policies have been developed by the American Association for Health, Physical Education, and Recreation.[20] Timm has written the most complete treatise on the construction and maintenance of baseball facilities.[21]

Supervision of players and spectators

Nothing is more conducive to accidents than equipment strewn on the ground, players "horsing around" on the bench, or spectator crowding the playing area. To minimize accidents, the coach and/or other persons in charge must have definite procedures to follow for every player and spectator during the practice and the game, and insist that they be followed. This is particularly true during practice because of the varied activities conducted simultaneously. LaPlace and Litle have excellent suggestions for the conduct of practice and game procedures.[22,23] Young gives excellent pointers for indoor batting pract[24]

[20] American Association for Health, Physical Education, and Recreation, *School Safety Policies With Emphasis on Physical Education, Athletics, and Recreation* (Washington, D.C.: The Association, 1968), pp. 18-21.

[21] Coombs, *op. cit.*, pp. 267-321.

[22] John LaPlace, Let's keep baseball safe, *The Athletic Journal* 39 (Jan. 1959), pp. 10, 53-55.

[23] Billy Jean Litle, Softball safety, *Journal of Health, Physical Education, Recreation* 36 (May 1965), pp. 46-47.

[24] Dick Young, Safety in your indoor batting cage, *The Athletic Journal* 44 (Febr. 1964), p. 36.

References

American Association for Health, Physical Education, and Recreation. *School Safety Policies With Emphasis on Physical Education, Athletics, and Recreation.* Washington, D.C.: The Association, 1968. 32 pp.

Coombs, Jack. *Baseball.* Revised by D. Litwhiler. 4th ed. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967. 333 pp.

Dzenowagis, Joseph G. *Baseball, Safety Education Data Sheet No. 71.* Chicago: National Safety Council, 1966. 4 pp.

Hein, Fred V. Health aspects of accident prevention. In *1963 Annual Safety Education Review.* Washington, D.C.: American Association for Health, Physical Education, and Recreation, 1964. 119 pp.

Herbold, John O. II. *Illustrated Guide to Championship Baseball.* West Nyack, N.Y.: Parker Publishing Co., Inc., 1968. 268 pp.

Howard, Elston. *Catching.* New York: The Viking Press, 1966. 88 pp.

Kuenn, Harvey and Smilgoff, James. *Big League Batting Secrets.* Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1958. 237 pp.

McConnell, Mickey. *How To Play Little League Baseball.* New York: The Ronald Press Co., 1960. 148 pp.

Owen, Mickey. Play it safe. *School Safety* 2:4-6, March-April 1967.

Polk, Ronald G. The frequency and causes of baseball injuries. *The Athletic Journal* 49:19-20, 53, Nov. 1968.

Rawlinson, Ken. General treatment rules: Contusions, strains, sprains. *Scholastic Coach* 38:88, Sept. 1968.

Ryan, Allan J. *Medical Care of the Athlete.* New York: McGraw-Hill Book Co., 1962. 343 pp.

Spackman, Robert R. *Conditioning for Baseball.* Springfield, Ill.: Charles C. Thomas, Publisher, 1967. 89 pp.

Taylor, Buddy. Taking care of the pitcher's arm. *The Athletic Journal* 49:60, Nov. 1968.

Weiskopf, Don. *Baseball the Major League Way.* New York: The Ronald Press Co., 1962. 225 pp.

———. St. Louis Cardinals' conditioning program. *The Athletic Journal* 49:10-12, 21-25, 64-67, Dec. 1968.

Basketball

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Basketball was introduced in 1891 by James A. Naismith, M.D. as a game to be played indoors during the cold months. Changes and modifications have refined the game to the point where the participant must be in good physical condition if he is to play effectively. As basketball developed it lost its characteristics as a noncontact sport. Today there is a great deal of body contact and very little protective equipment to help avoid injuries.

While agility, quickness, coordination, and desire are important qualities of a good basketball player, he must also be adequately conditioned to carry on his assignments without undue fatigue, a contributor to accidents. For this reason it may be wise to employ a strength development program in conjunction with preseason or prepractice drills. Many coaches have found that such programs result in improved jumping ability, endurance and stamina, and confidence. The exercise program should be concentrated on the legs, back, arms, and shoulders, since these are the important body areas in basketball.

Because today's players [illegible] bigger, faster, stronger, and in better [illegible] the action is much rougher. The main [illegible] of injury are colliding with other players, being struck by playing equipment, collision with extraneous objects, slipping on the floor (from perspiration, dirt, or debris), twisting an ankle or knee, unnecessary roughness, poor physical condition, improper physical and personal equipment, and tripping over play equipment.

Significantly, the incidence of serious accidents among basketball players often has been the result of infection from relatively minor injuries that did not receive immediate postgame or postpractice attention. Before the season starts and prior to the opening practice, each player must have a complete physical examination and written approval of the physician.

The following are suggestions to help minimize injuries during participation in basketball.

Personal gear

1. Each player must have well fitting shoes specifically designed for basketball. The shoe should have a nonslip tread and shock absorber properties under the heel and transverse arch of the foot. The shoe must also afford adequate ventilation. The properly fitted shoe is the most important personal item of the basketball player.
2. A thin pair of socks under the regular sweat socks will help prevent blisters.
3. To lessen the risk of crippling blisters, especially in early season workouts, every player should paint his feet with tincture

of benzoine or some similar product, then liberally powder the feet to reduce friction. Running barefoot in sand prior to reporting for practice will aid in toughening the skin on the bottom of the feet. It is also a good practice to use foot powder before and after practice.

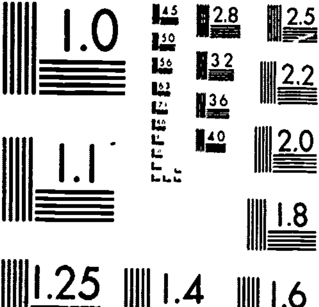
4. Safety lenses should be used only by players needing glasses, and they should be firmly secured. Contact lenses are desirable since they reduce the risk of serious eye injury from broken glasses. Players not using either of the above should wear a protective guard over the glasses. All jewelry should be removed when playing.
5. Trunks should be equipped with light hip pads.
6. Padded knee guards are a valuable piece of equipment since they help eliminate floor burns and bruised bones.
7. A properly fitted brace should be provided for players with weak knees.
8. Warm-up clothing should be provided and worn for pregame drills and practice.
9. Individual towels or ample clean towels for players prevent passing disease germs among squad players.
10. Advise players to do daily running prior to the beginning of organized practice. This will help improve endurance, condition legs, and reduce the possibility of strained muscles.

The physical plant and field equipment

1. There should be a minimum of 12 to 16 feet of free space at the end lines and six feet along the sidelines.
2. Gymnasiums with endlines that are close to the wall with permanent bleachers, stairwells, and permanent apparatus equipment should be checked for dangerous corners and protruding equipment. Such places should be adequately covered with plastic or canvas check-mats.
3. With large numbers of players in varsity and reserve squads, intramural teams, and physical education classes, the rollaway bleacher is preferable to the permanent bleacher arrangement at floor level. The cross courts thus made available with large playing areas will reduce accidents.
4. All wall attachments should be recessed or padded.
5. Benches, including timers and scorers, and other obstructions should be kept as far away as possible from the playing area.
6. Basket supports should be properly padded to avoid injury when body contact is made with them. Supports attached directly to the wall behind the basket or supports suspended from overhead are preferred to free standing apparatus.
7. A rack of some type should be used to hold basketballs that are not being used, and action should be stopped whenever a loose ball rolls into the playing area.
8. Players should not be permitted to leave any piece of playing equipment near the playing area, especially under the basket.
9. Shower, locker, and training rooms should be kept spotlessly clean. A walking surface that provides good traction even when wet should be used. Recessed handles, soap dispensers, and an adequate number of showers to prevent crowding will help reduce accidents.
10. Playing floors must provide a resilient, nonslip surface and they should be thoroughly mopped before every practice and at half time of each game.
11. Cool drinking water from sanitary paper cups should be provided if there is no fountain immediately available to the floor.

Practice and game routine

1. Correct execution of fundamentals is a reliable safety measure.
2. A properly conducted warm-up drill before the game or practice session decreases the possibility of injuries. About 20 to 30 minutes should be adequate.
3. The early season workouts should be designed so players will develop their physi-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cal condition and thus be able to go the full length of the game at peak efficiency.

4. During hard practice sessions, especially in early season workouts, frequent rest periods should be provided. This maintains a high level of alertness and lessens the fatigue factor as an accident possibility.
5. Players, particularly those with weak ankles, should have their ankles either taped or wrapped before every practice and every game. If it is not possible to have a team trainer, a student manager can learn how to wrap and tape ankles by contacting a varsity trainer at a college or university.
6. All practice sessions should have constant supervision by the teacher or coach. If for

Figure 1. Balance and body control are essential.

any reason they must leave the area, the team captain or some other responsible person should be left in charge.

7. Salt tablets should be taken, if excessive perspiration occurs, to maintain saline balance of the body.
8. Because bad weather prevails during a major portion of the basketball season, precautions should be taken to ward off any illness that could develop. Warm clothing, scarves, and head covering should be worn particularly after a hard game when players are fatigued.

General administrative precautions

1. A doctor should be on call during practice sessions and present during contests.
2. A complete physical and dental checkup should be made before the season opens, preferably by the family physician, again at midpoint, and after the season is over.
3. A complete weight chart should be used and players should weigh in and out for all practice sessions.
4. After an illness or an accident, permission should be secured from the doctor before allowing the participant to resume playing and practicing.
5. A first aid kit should be available for the coach or trainer. A thorough knowledge of first aid is essential to safety.
6. Clean towels, socks, and supporters should be issued to lessen chances of infection and injury.
7. All practice scrimmages should be well officiated. If not, play is likely to get rough, thus increasing the chances of injury.
8. When bus transportation is used for travel, all members of the team should ride on the bus with no exceptions. The coach is responsible for the safety of the participants whenever travel is involved. Only qualified drivers should be used.
9. Competent and registered officials should be engaged for all interschool competition. They should be conscientious about the safety of the players in handling the play situations. Student officials should be trained to handle practice, intramural, and recreational play.
10. Provision for some kind of accident insurance should be made to cover participants.

These safety regulations can be easily adapted to girls' basketball. The instructor should discourage girls from playing by boys' rules, however, as few girls are physically suited to so strenuous a sport.

References

Annheim, Daniel D. and Klosfs, Carl. *Modern Principles of Athletic Training*. St. Louis, Mo.: C. V. Mosby Co., 1963.

Florio, A. E. and Stafford, G. T. *Safety Education*. 3d ed. New York: McGraw-Hill Book Co., Inc., 1969. 459 pp.

Hanson, William. Staff utilization and strength development. *The Coaching Clinic*. 7:7-9, no. 7, June 1969.

Lews, F. Dwain and Sanderson, Douglas. *How To Avoid Injuries*. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1969.

National Collegiate Athletic Association. *Basketball Rule Book*. Kansas City, Mo : The Association. Current edition.

Ryan, Allan J. *Medical Care of the Athlete*. New York: McGraw-Hill Book Co., Inc., 1962. 343 pp.

Field Hockey | JANE ANNE MAVER, M.S.

14

Many physical educators have considered field hockey too dangerous to be included in a school program. Since field hockey involves striking a ball with an implement, there are ample opportunities for accidents to occur. This does not mean, however, that accidents and injuries are an inevitable outcome of participation in the sport.

Perhaps the most common accidents involve bruises to the legs. These usually result from improper fielding of the ball, but this situation can be corrected by wearing the proper equipment, practicing the basic fundamentals, and playing on a smooth, level field. Accidents also are more probable when a ball is lofted or undercut, striking a participant on the body or head. This is most likely to occur when field conditions are slippery or when players become fatigued. Both conditions result in players being unable to move into position properly to take a hit, and thus the ball is played from a position well away from the body.

Conditioning

Field hockey can place great demands on the participants' cardiovascular respiratory endurance; during the season it is important that preparation for competition include activities which promote fitness in this regard. The maximum playing time is 70 minutes or two 35-minute halves (unless otherwise agreed).[1]

The usual warm-up period prior to play is desirable. It generally includes the practice of skills and plays that will be employed in the game.

Facilities

One of the more important considerations concerning facilities is that practice and play should be conducted on a smooth, level field. Sprains are more likely to occur if there are depressions in the ground or the footing is uneven. On a bumpy or hard field with loose dirt or stones, a ball is more likely to rebound or be lofted, and this may be the precipitating cause of an accident. If the field becomes slippery because of poor weather conditions, it is wise to discontinue play, particularly with less skillful players, as undercutting of the ball may become more prevalent.

Rule 4 states the specifications for the goals,[2] but there is one requirement which is not always adhered to — that of using nets to enclose the

[1] American Association for Health, Physical Education, and Recreation, The code of rules for the game of hockey for women, in *DWGS Field Hockey-Lacrosse Guide August 1970-72* (Washington, D.C.: The Association, 1970), p. 81.

[2] *Ibid.*, p. 83.

goal area. Many times the goal cage is constructed of wire mesh, usually in the interests of easier maintenance. The use of wire is not as safe as netting since hard hit drives for goal are more likely to rebound back into oncoming players or the goalkeeper. Also, a forward whose momentum carries her into the cage is more liable to injury if she runs into mesh rather than netting. The use of wire to secure the mesh to the goalposts may also be hazardous. Protruding strands with sharp points may be a cause of cuts and scratches for participants playing in or near the goals.

Equipment

Strict adherence to the requirements concerning hockey sticks, as stated in the rules, will offset a potential cause of accidents.[3] Particular care should be taken to check periodically for splinters and sharp edges on the sticks.

To lessen the risk of a player being bruised on the shins and ankles, participants should wear protective shin guards. This is particularly true for the less experienced player who may have more difficulty with fielding skills. Shin guards which buckle around the legs should be checked to see that straps are not hanging, as this could cause the player to trip. It is also advisable that this type of shin guard be buckled to the outside of the legs to reduce the chance of the legs being rubbed or cut by the buckle. Players who use shin pads which fit down into kneesocks should be certain that the guard is firmly secured in place to prevent it from slipping.

It is recommended that players wear a hockey sneaker that has cleats which will provide better traction. There are different types of hockey shoes and selection is usually a matter of personal preference. "No player shall have any metal spikes, metal studs or protruding nails in boots or shoes."[4]

Players who wear glasses which do not have shatterproof lenses should wear a protective glasses guard. Some players also want to use a mouth protector to minimize damage to the teeth as a result of collisions or being struck by a ball.

The goalkeeper should wear the proper protective equipment including goalie pads which are heavily padded and cover the leg to mid-thigh, kickers or goalie boots for the feet, and a glove for the left hand. Some goalkeepers also elect to include a full face mask as a part of their equipment. No player should practice goalkeeping skills or participate in competition without being properly equipped.

Officiating

Rules which prohibit dangerous hitting or undercutting, hitting or kicking the ball into a player, raising the stick above shoulder level, and any roughness such as pushing or tripping should be strictly enforced. These rules have been designed for the safety of the participants, and the officials are responsible for controlling the conduct of play through the enforcement of these rules.[5]

Coaching

In field hockey, as in most sports, accidents can be reduced when players are well coached and demonstrate good performance in the fundamental skills of the game.

Coaches need to stress constantly that players should try to be aware of other players around them. This is difficult for players as they bend over and their focus of attention is on the ground or ball while executing the dribble, a pass, or a dodge. Emphasizing positioning, looking up, and awareness of others on the field is not only consistent with good performance but will lead to a climate of safety in the game.

Spectators

Spectators should be seated away from the sidelines of the field. Practice balls, extra equipment, clothing, or other objects should also be

[3] *Ibid.*, p. 83.
[4] *Ibid.*, p. 84.
[5] *Ibid.*, pp. 85-86.

cleared away from the sideline and endline boundaries. When the spectators sit on the ground, which is often the case for field hockey, they need to have more time to react and move out of the way of hits which go over the sideline. This is not only in the interest of safety, but it also allows the wing to have sufficient room outside the sideline in order to play her position properly, and it enables the official to move freely up and down the field. It is not advisable to allow spectators to be seated near the goal cages since a hard drive which misses the goal could be injurious if it were to strike someone.

Medical examinations

It is highly recommended that all players have an examination by a physician at the beginning of the field hockey season. This is mandatory in some school situations. It is often the club or association player who fails to take this precautionary measure.

Tackle Football | CARL S. BLYTH, Ph.D.

15

In the United States more than 15,000 public and private secondary schools field organized football teams each fall, with a total of some 1.2 million young men participating. Another 100,000 young men participate at the college or university level. In addition, it has been estimated that some 200,000 boys are suited-up for competition by various community and social agencies such as Metropolitan Police, Boys Clubs, Lions Clubs, Kiwanis Clubs, church groups, and many others. If the many thousand boys who play in football games of the sandlot or semi-organized variety were included, the total number playing the game would probably reach two million.

Many physicians feel that as many as half of these participants are victims of at least slight injuries each season. Any health problem which affects over a million young men annually is a significant health problem. Naturally, the problem is recognized by those closest to the game—the coaches, school administrators, team physicians and trainers, physical educators, and, of course, the parents.

Football injuries have been accepted generally as an uncomfortable by-product of participation in the game. And in a sport requiring vigorous physical contact within a restricted area for 48 to 60 minutes at a time, injuries are certain to result. However, every effort should be made to assure that the potential for injury is kept to the absolute minimum. The following suggestions, recommendations, and comments are offered to help coaches, athletes, school administrators, and parents prevent and reduce injuries associated with tackle football.

Medical evaluation

Mandatory medical evaluation and medical history must be taken at the beginning of each season before an athlete is allowed to participate in any football activity. The complete medical history and medical examination should be on file with the proper school authorities where it will be readily available if needed. It should also be required that a physician give written approval to permit a player to return to practice and competition after injury, especially if the athlete has incurred a head injury.

Whenever possible, a physician should be on the field of play during game and practice sessions. When this is not possible, arrangements must be made in advance to obtain a physician's immediate service should an emergency arise. Each institution should have a team trainer who is a regular member of the staff and is qualified in treating and preventing injuries.

Every school and institution fielding a football team must subscribe to an athletic injury insurance program.[1] There are several plans available and the type secured will depend upon the policies of the communities and states involved. An excellent source for information on athletic injury insurance is the American Medical Association's Council on Medical Services.

Physical conditioning

Top physical performance can only be achieved by the athlete who is in top physical condition; conversely, the athlete in poor physical condition will give a poor physical performance. But more important, the poorly conditioned athlete is more susceptible to disabling injuries.

Sound physical conditioning programs should be made available for all youth. But since the football athlete is exposed to body contact athletics, he should have a preseason conditioning program planned for him by the coaching staff.

It is strongly recommended that the first week of football practice be a graded type of conditioning program with particular emphasis on learning the system to be employed, the signals, the plays, and timing. The physical conditioning program should include activities which will strengthen the body and reduce susceptibility to fatigue. There are many types of physical conditioning programs, but running, grass drills, and wind sprints should be included in all of these programs. Considerable effort during the initial conditioning period should be devoted to "dummy-type scrimmage" involving the football skills to be learned. This type of practice not only conditions the body but develops psychomotor efficiency in the performance of football skills.

Preseason practice

The majority of state high school athletic associations, as well as the National Collegiate Athletic Association, require a preseason physical conditioning period of from three to seven days for all football athletes before any physical contact between players is permitted. Research has shown that the mandatory physical conditioning period reduces the number and severity of football injuries during the early fall practice period.

When football activity is carried on in hot weather, the following precautions should be taken: (1) schedule practice sessions for early morning or evening during August and early September; (2) acclimatize athletes to hot weather activity by carefully graduated practice sessions; (3) provide rest periods of 15 to 30 minutes during workouts of one hour; (4) furnish extra water and salt in recommended amounts (a recognized replacement for fluid loss is a sterile 0.1% saline solution — that is, two teaspoonsful of ordinary table salt for each gallon of water; it is generally suggested that it be ingested at the rate of at least one quart per hour during extreme perspiration); (5) watch athletes carefully for signs of trouble (fatigue, lethargy, inattention, stupor, awkwardness, etc.), particularly the determined athlete who may not report discomfort; (6) remember that temperature and humidity, not the sun, are the important factors and that heat exhaustion can occur in the shade.

Coaching staff

The head football coach is the most important individual in establishing a successful sports program. His attitude and leadership in promoting the safety factor in football determines whether or not his football program will be successful. Securing of competent and experienced coaching staff is one of the most difficult assignments facing the school administration. If a school or institution cannot provide a well trained and capable coaching staff, consideration should be given to the elimination of the sports activity from the institution's athletic program.

The head coach is responsible for the total football program and should seek competent and dedicated help. It is the responsibility of the coaching staff to teach the football skills in an environment free from unnecessary hazards. All

[1] An example of a football injury report form appears in Appendix B.

coaches should take the necessary precautions to assure excellence in the physical condition of their athletes. Proper conditioning reduces the frequency and severity of injuries and increases the morale and the desire of the athlete to compete in wholesome physical activity. The coach who is lax or hurried in the physical conditioning program of his athletes jeopardizes both the athletic program and the health of the student athletes.

Participation in football can foster desirable health habits. The coach should take advantage of teaching situations and inculcate acceptable health practices in his student athletes. There is no place in a football program for the attitude of winning at any price if the health of the student athlete is jeopardized. The encouragement of hazardous and abusive tactics which endanger the welfare of the student athlete should not be tolerated.

A safe football program depends upon careful planning and organization by the head coach. Much of the responsibility for parts of the program may be delegated to other personnel, but the head coach is the final authority in seeing that all phases of the program are conscie tiously carried out.

Rules and regulations

Another method of promoting safety in football is to establish and enforce a sound set of rules and regulations. Many unnecessary injuries occur every year because of a poorly defined rule, the lack of a rule, or the improper enforcement of a rule. It is imperative that each school employ competent contest officials to officiate at interscholastic games. Coaches must instruct their athletes within the rules and must not take advantage of the rules by permitting their players to use abusive and hazardous tactics under game or practice conditions.

Athletic governing bodies of colleges and high schools meet each year to promote research to determine the causes of football injuries and vote on rules which enhance the safety factor in football. Rules and regulations governing football are extremely important in the prevention of injury to the participating athlete. But of prime importance is the official's responsibility to enforce the rules and the coach's responsibility to coach within the rules.

Equipment

There are no standards to assist the purchaser of protective football equipment. The following comments are a guide to the buyer of football equipment for any age group of athletes: (1) the purchaser must deal with reputable sporting goods manufacturers and representatives: (2) the buyer must purchase the best equipment available; (3) the football athlete must be properly fitted with his equipment; (4) protective equipment must afford adequate protection against the hazards for which it is designed and not create additional hazards; (5) protective equipment must be worn when appropriate and when the football activity demands it; and (6) old and worn equipment should be renovated or, preferably, discarded. The old and worn equipment should never be handed down to players of lesser skill or younger age group teams. All football players should be given the best protection available.

When describing protective equipment for tackle football, special consideration should be given to the helmet. Although designed as a protective device, the helmet has been used as a weapon in recent years. A practice referred to as "spearing" has developed, that is, driving the head with force into the chest, stomach, and kidney area of an opponent when blocking and tackling. When the human head, encased in a hard plastic helmet, is used as a battering ram, there is danger of hyperflexion, hyperextension, or compression of the cervical vertebrae, as well as concussion. Head and neck injuries as well as fatalities have increased since the tactic of spearing was adopted by some football teams. Enforcement of the rules prohibiting spearing, properly fitted helmets, and excellent physical condition are the factors which will help reduce fatalities and serious head and neck injuries resulting from participation in tackle football.

Summary

Many injuries and fatalities associated with football can be eliminated or appreciably reduced if the following suggestions are observed:

1. Mandatory medical examinations and medical history should be taken at the beginning of each season before allowing an athlete to participate in any football activity.
2. All personnel concerned with training football athletes should emphasize gradual and complete physical conditioning.
3. A physician should be present at all games and practice sessions. If it is impossible for a physician to be present at all practice sessions, emergency measures must be provided.
4. All personnel associated with football participation should be aware of the problems and safety measures related to physical activity in hot weather.
5. There should be strict enforcement of game rules and administrative regulations in order to protect the health of the athlete. Coaches and school officials *must* support the game officials in their conduct of football activities.
6. There should be continued emphasis on the employment of well trained athletic personnel and the provision of excellent facilities and the safest equipment possible.
7. Finally, there should be continued research concerning the safety factor in football.

References

American Medical Association. *A Guide for Medical Evaluation of Candidates for School Sports.* Chicago: The Association, 1966. 5 pp.

———. *Tips on Athletic Training, XII.* Chicago: The Association, 1970.

Blythe, Carl S. and Arnold, David C. Thirty-seventh annual survey of football fatalities 1931-1968. In *Proceedings of the Forty-Sixth Annual Meeting.* Hanover, N.H.: American Football Coaches Association, Jan. 1969.

Pre-Season Conditioning Manual. rev. ed. New York: American Football Coaches Association and Tea Council of the USA, Inc., 1970.

Ryan, Allan J. *Medical Care of the Athlete.* New York: McGraw-Hill Book Co., 1962. 343 pp.

Trickett, Paul C. *Prevention and Treatment of Athletic Injuries.* New York: Appleton-Century-Crofts, 1965. 117 pp.

Touch and Flag Football | JOSEPH G. DZENOWAGIS, Ed.D.

16

From kids playing on pickup teams after school, to adults enjoying a corecreational game on weekend afternoons, to Saturday morning "powder-puff" games, more people are playing touch and flag football today than ever before.[1]

The popularity of this limited contact game seems to have surpassed that of baseball as the number one vacant lot activity among youngsters. Young adults as well have rediscovered the sport which was once known as "sissy" football.

The resurgent interest in touch football is being felt beyond the vacant lot level of play. Schools are increasingly inclined to include touch in the sports program, and community organizations sponsoring sports activities for youngsters show an increase in touch football league play.

On both organized and informal levels of play activity, it can be estimated that touch football and its many variations are being played today by several million young people, among them a generous sprinkling of females.

Unfortunately, the informal nature of the game together with the wide range of ability, experience, and training of the participants creates circumstances that maximize the accident and injury potential of this activity. On the sandlot, for example, [illegible] often the similarity between what passes for a game of touch and standard touch football is purely coincidental — or accidental, as the case may be.

Teams are made up of those available to play divided as equally as possible. The field of play is generally any accessible area of unspecified size. Rules are informal and subject to frequent change; the only equipment used is a football of any description. Few of the players, if any, bother to warm up with pregame exercises. Older players may neither recognize their own limitations for physical activity nor question the wisdom of participating in rugged competition against younger, more fit players. Younger players may not understand the rules of the game and may be unaware of the hazards involved in playing under poorly controlled conditions.

It is little wonder that accidents and injuries occur under these circumstances. Although there is little specific data available concerning the extent of touch football injuries that occur in organized play and even less in informal play, it is estimated that at least one person a year dies as the direct result of a touch football mishap.

On the other hand, touch football played under the supervision of experienced personnel is accompanied by regulations that prevent acci-

[1] Flag football is a variation of touch in which each player wears a flag in his belt. The tag is made by snatching the flag of the ball-carrier.

dents and injuries. The more sophisticated forms of the game as played in class, intramural, or interschool competition on upper elementary, secondary school, and college levels are generally closely supervised and strictly officiated. The rules are adapted to the limitations of the players who may be uniformed with protective garb, who are teamed according to size and ability, and who have been coached and instructed in proper play and safety techniques to minimize accidents.

In spite of precautions, however, even under supervised play injuries continue to occur. It is estimated that about 5,000 of the 350,000 male college students who participate annually in intramural touch football are injured seriously enough to seek medical attention.[2] Figures are not available for other age groups probably because the informality of the game precludes routine reporting, analysis, and publication of data.

Hazards

A few investigations, mainly on the college level, have been made into the character of the injuries sustained by touch football players.[3] A close look at the nature and extent of these injuries is revealing.

Studies conducted at Michigan State University involving more than 25,000 participants showed that bruises, sprains, and cuts were the injuries occurring most frequently in men's intramural touch football.[4] Most of the injuries involved the head, face, knees, and ankles and were of a minor nature with only a small percentage considered serious.

The majority of the injuries resulted from collisions, action in blocking or being blocked, falling, and being struck by another player's elbow. Injuries caused by falls were most commonly bruises and sprains. Where injuries occurred through blocking action, they were mainly bruises, sprains, and strains. Injuries from collisions were also bruises, sprains, and, in addition, cuts. When a player made severe enough contact with another player's elbow, the injuries were most often bruises and cuts or damage to the teeth.

The injury frequency rate of touch football is consistently higher than that of most other intramural sports. The touch football injuries alone at Michigan State University accounted for more than 40% of the total number of injuries in the school's entire men's intramural program.

Prevention and control

Examination of available information concerning accidents and injuries sustained through playing touch football indicates some direction toward prevention and control of accidents and injuries.

Since the action that most often leads to injury in touch is collision with an opponent or a teammate, players should anticipate the probable action of others around them and be prepared to move out of the way or know how to cushion unavoidable body contact. Rules concerning blocking action should be strictly enforced by officials, and players should be cautioned with regard to the severity of the blocks they use.

To prevent falls and the injuries resulting from falls, a player should know the basic principles involved in falling without sustaining injury. He should understand the relationship of the center of gravity to body control, how to establish a wide base of support, and how to spread the impact of a fall over a large surface area of the body. The player needs also to know how to use his joints flexibly in order to absorb the shock of landing and how to relax and roll as he falls.

Since a high percentage of injuries occurs to the head and face, the use of properly fitted headgear, face guards, and mouthpieces should

[2] Joseph G. Dzenowagis, Touch football, in *Safety Education*, 1st ed., edited by A. E. Florio and G. T. Stafford (New York: McGraw-Hill Book Co., 1962).

[3] Joseph G. Dzenowagis, *Injuries in Men's Physical Education and Intramural Sports*, Monograph, no. 14 (Chicago: National Safety Council, 1962).

[4] Lawrence Sierra, "Accidents in Intramural Sports." Mimeographed. East Lansing, Mich.: Michigan State University, 1966.

reduce the frequency and severity of injuries to these areas.

However, the use of such protective equipment can engender a false sense of security and safety among the players, with the result that the game can be rougher and injuries may continue but with greater severity. Similarly, the use of an elbow guard may cut down on cuts and bruises, save teeth, and help protect a player when he falls. On the other hand, it may also encourage more reckless play and thereby increase injuries.

There is considerable controversy concerning the value of certain kinds of protective equipment for use in touch football. Research studies concerning the design and effectiveness of protective equipment are needed.

In addition, certain basic safety measures can be instituted in the formally organized sport and recommended for carry-over into pickup games.

Apparel appropriate for the game should be worn, with sneakers and nonrestrictive clothing recommended. Objects such as pins and pencils in pants pockets should be removed. Spiked or sharp cleated shoes should not be allowed.

A player who wears glasses should wear the kind designed for safety with proper lens and safety frames. In addition, the hinge and bridge areas should be padded or taped.

Players should be conditioned before playing and should have a sufficient warm-up period before each game. An individual recently recovered from an illness or disability should first see his physician to establish his readiness to resume play. Medical examinations and proper follow-ups should be given to all participants in school supervised touch football.

The playing field should be free of holes, stones, or other obstacles that might contribute to injury. It should be well marked and large enough to accommodate freely the size of the group using it.

Rules should be modified to accommodate the size and ability of the players, and all of the players should understand the rules clearly. The game should be regulated by strict enforcement of the agreed upon rules.

Even after all safety measures have been taken, accidents and injuries will occur. Most of these will be minor, but some will be serious. The responsibility of adult leadership is to minimize the frequency and severity of these injuries.

Physical education teachers should teach the fundamentals and safety skills of touch football at the appropriate grade levels. They should instill in youngsters the proper social attitudes that will encourage them to participate safely and with enjoyment in pickup games on the neighborhood playground or in their own backyards. Other leaders of youth activities have a simliar commitment to the safe conduct of the touch football games that they supervise.

Touch football can be a relatively safe activity. Only when it is played with lack of regard for the rules and lack of respect for the safety of the players can it be considered a dangerous sport.

References

Sierra, Lawrence. "Accidents in Intramural Sports." East Lansing, Mich.: Michigan State University, 1962.

Consultants

Lawrence Sierra, Michigan State University, East Lansing, Mich.

Ice Hockey | JOHN CONLEY, Ph.D.

17

The first fatality in the 51 year history of Canada's National Hockey League was attributed to a massive internal brain injury suffered by a player when his head slammed onto the ice during a recent game. The player would probably be alive today if he had worn a helmet. Has the tragedy led to other NHL players switching to helmets? No! Only a few would rather wear them than risk permanent injury or death.

Although this was the first fatality in the NHL, there have been many deaths outside the League. In 1966, a 30-year-old Ontario schoolteacher died 10 days after suffering a head injury in a game between teachers and students. In 1965, a student from McMaster University in Ontario died of head injuries after lying in a coma for three weeks. In 1963, a 26-year-old minor league player died of head injuries in Ottawa.[1]

The list runs on and on, with the majority of hockey fatalities resulting from head injuries. Needless to say, there have been many near misses where the injured player suffered only a minor injury, such as a concussion. Most of these injuries and fatalities could have been prevented with the use of good hockey helmets but players will not wear them. Most complain of profuse perspiring, impaired vision, or lack of comfort. Some feel that helmets makes them look like sissies or that they lose their individuality on the ice. The only way to protect all hockey players from major head injuries is to make the wearing of a helmet compulsory at all levels, in practice as well as in games!

How dangerous is ice hockey? Whether the player is an expert who skates on two thin blades at speeds in excess of 30 miles per hour, or a young child maneuvering unpredictably at five miles per hour, the potential for injury is great.

The injury picture

Of all the major sports played in North America, ice hockey has the least research into injuries and the poorest records. Even in Canada, hockey capital of the world, few teams or leagues keep injury records. The only way to obtain an idea of the type and extent of injuries is from personal experience and observation or through discussions with coaches and players. Most articles and books written about hockey devote little or no attention to the accident problem.

Most hockey injuries are minor. Cuts about the face and loss of teeth are the most common. This type of injury is caused primarily by being

[1] Trent Frayne, The NHL's first fatality — and the hockey helmet taboo, in *The Star Weekly Magazine* (Feb. 3, 1968), p. 43.

hit with a stick or .. Occasionally players are cut by skates w... ...all or are knocked to the ice. The latter cause is more prevalent in beginning hockey since novices are awkward on skates. Although these injuries can never be totally prevented, they can be minimized by the use of helmets and mouthpieces; good officiating to minimize high sticking, slashing, and cross-checking; and the coaching of players to protect their head and face with their arms and gloves when knocked to the ice or into the boards.

Goalies in hockey have a special problem. Although wearing a mask is more common now, many leagues do not make it compulsory. This is the only way to protect goalkeepers from flying pucks, high sticks, and scrambles in front of the net. Goalies also have the unique occupational hazard of groin injuries while doing the splits and hand injuries from catching the puck. Proper conditioning and warm-ups will minimize the former.

John Corbett, coach of the University of Western Ontario hockey team, stresses iso-...rics and weight training for all his players and insists on at least 15 to 20 minutes of pregame warm-up. He states that just as many injuries occur in practice as in games so that the same precautions should be observed. Corbett warns about the increased injury problems that occur late in the season, late in a game when the players are tired, and during playoffs. He recommends quicker line changes to help alleviate this problem.

Hockey players are afflicted with other injuries which are either not too serious or rare in nature. Bone bruises, especially around the ankle from being hit by a puck, are common but not serious. Equipment of good quality and proper fit can minimize this problem. Few players, for instance, wear ankle protectors, shoulder and elbow pads, or proper thigh and slash guards. There is no excuse for not using protective equipment when it is available.

Other hazards unique to hockey include striking goalposts that are too rigidly attached. Many older goals have long pipe insertions. Short ones should be substituted so that if they are hit forcefully the cage will move. For young hockey players the goals do not need to be attached at all.

Many hockey players are injured because spectators throw coins, paperclips, paper, eggs, ink, paint, wood shavings, and other objects onto the ice. Only proper supervision of crowds by the arena management or local police, and education of the spectators about the injury problem, can prevent this needless hazard.

A Toronto study[2]

In a 1963-64 Toronto Township Hockey League study of 2,469 players ranging in age from 7 to 18 years, all injuries requiring a doctor's services were analyzed. Principal distribution of the 85 injuries was as follows: mouth 25%; eyes 15%; nose 10%; head and forehead 18%; knees 7%; wrists 6%; ribs 3%; ankle 3%; fingers 3%. The main causes of these injuries can be summarized as follows: sticks 25%; puck 19%; skates 9%; striking the boards 17%; falls and body checks 13% each. Whereas head and facial injuries were caused primarily by hits from a stick, puck, or skate, body injuries generally resulted from a check or fall. The age of the participants did not correlate with any particular type of injury, although body injuries were more common among the 14- to 18-year-olds.

The Toronto Township Hockey League requires helmets and mouthpieces for all hockey players. Consideration was given to using a face bar on helmets but no decision was made. However, two rules were modified in an attempt to minimize facial injuries. First, sticks must be carried below waist level. Second, the slap shot was outlawed since the stick is raised quite high on this shot. Since 50% of the body injuries are caused by checking and hitting the boards, more vigorous rules enforcement regarding body checking and boarding was recommended. Also, referees were to be instructed to be very fast

[2] Jerry Love and Ted Toogood, "Toronto Township hockey league injury survey." Mimeographed. 1965.

on the whistle, especially on the boards and around the net.

Conditioning

As in any sport, proper conditioning before and during the season will minimize injury. Bill L'Heureux mentions several special conditioners for hockey players.[3] He advocates back bending exercises to meet the strain of holding a bent position on skates. Also, ankle, foot, and knee stretching aids in carrying the load of the body on skates. Skating uses muscles unique to the sport because a player moves on the ice with a semisideways leg push. Side leg raises with a weighted boot or manual resistance greatly strengthen a player's skating ability. Hopping on one leg and heel raising strengthen the ankles. Edward Jeremiah advocates working on the adductor muscles to give much needed strength to the groin muscles.[4]

Of course there are many other exercises that are beneficial to hockey as well as to other sports. Running and skipping helps the legs. Stops and starts are excellent leg strengtheners. Pushups and chinups will strengthen the arms, wrists, and shoulders. Wrist curls with a barbell improve shooting. Since balance is so important, ballet work in preseason drills, with and without skates, will minimize falls and checks.

In *The Hockey Handbook*, a must for coaches and players, Lloyd Percival describes many more team and individual drills.[5] He criticizes poor warm-ups as a major cause of injuries.

> Warm-ups should be strenuous enough so that every player is sweating heavily before the game starts. . . . However, particularly at low level organized hockey, there is sometimes insufficient time for a good ice warm-up. . . . Special warm-up exercises should be done in the dressing room before the skates are put on.[6]

[3] William J. L'Heureux, *RCAF Sports Series: Hockey* (Ottawa, Ontario: Royal Canadian Air Force, 1956).

[4] Edward J. Jeremiah, *Ice Hockey*, 2d ed. (New York: The Ronald Press Co., 1958).

[5] Lloyd Percival, *The Hockey Handbook* (New York: A. S. Barnes and Co., 1961).

[6] *Ibid.*, pp. 306-307.

Equipment

Hockey equipment available today can do a great deal to prevent or minimize injuries if a player uses it properly. Too often a young player who is growing rapidly is still using ill fitting equipment which does not protect him properly. This is particularly true of pants and skates. Those which are too large or too small will hamper the player's skating and make him more vulnerable to injury. Many young players do not wear an athletic support with a metal cup. This can seriously injure even the youngest of players. Often insufficient underclothing is worn and the player is without proper warmth or absorption protection. Stockings, shin pads, pants, elbow and shoulder pads, sweater, gloves, helmet, mouth guard, athletic support, skates, and stick should be standard equipment for hockey players of all levels.

Hockey players use large amounts of tape to keep equipment in place. If the shin pads, in particular, are allowed to slip, injury possibilities are greatly increased. Also oils put on the feet help toughen the skin and prevent blisters and sores which are so common early in the season. Cotton or rubber pads inserted under the skate tongue prevent lace soreness.

Goalies have special equipment needs. In addition to the equipment worn by other players, a goalie must have arm, shoulder, and leg pads, a mask to protect him against facial cuts, and a chest protector to safeguard against bruises and possible broken bones when hit by the puck. A goalie also needs extra padding in the thigh and hip areas of his hockey pants.

Officiating

As in other contact sports, officiating is extremely important to prevent injury. At least two officials should be used in a game. If there is only one official, he will probably miss the multitude of illegal tactics such as holding, interfering, slashing, and so on which in themselves may not cause injury but which tend to irritate players into more violent retaliatory actions such as cross checking, high sticking, elbowing, charging, boarding, etc. Officials must be strict and consistent on all types of fouls, not just those which have the greatest possibility of causing direct injury.

Many players are unaware of the rules. It is a valuable service to players, coaches, and other officials if at least one practice session is devoted to reviewing the rules, especially those which have had recent changes. Most officials find it well worthwhile to spend this time with a team before the season begins.

Tips for injury prevention

1. Keep your head up at all times. Learn to stick handle and pass the puck without watching it.
2. Practice improving your peripheral vision so that you are aware of the total picture and where each player is situated.
3. Develop instinctive maneuvers in the corners and along the boards to prevent serious board checks.
4. When falling or being hit into the boards, protect your face and head with your arms and gloves.
5. Try to absorb the impact when hit by an opponent unless the combination of your size and speed is much superior to his.
6. Spread out on the rink. Do not overcrowd.
7. Do not lean on your stick. If you depend on your stick to keep you upright it is too easy to upset your balance.
8. Keep your stick below your waist and your elbows in. This will prevent injury to others and eventually to yourself.
9. Keep moving on the ice. A stationary target is the easiest to hit.
10. Wear properly fitting protective equipment all the time. The one time you forget may be the time you are injured.

References

Frayne, Trent. The NHL's first fatality — and the hockey helmet taboo. In *The Star Weekly Magazine*, p. 43, Febr. 3, 1968.

Jeremiah, Edward J. *Ice Hockey*. 2d ed. New York: The Ronald Press Co., 1958.

L'Heureux, William J. *RCAF Sports Series: Hockey*. Ottawa, Ontario: Royal Canadian Air Force, 1956.

Love, Jerry and Toogood, Ted. "Toronto Township Hockey League Injury Survey," 1965. Mimeographed.

Percival, Lloyd. *The Hockey Handbook*. New York: A. S. Barnes and Co., 1961.

Lacrosse | BRUCE A. CORRIE, P.E.D.

13

Grantland Rice, the legendary dean of American sportswriters, in describing lacrosse was quoted as saying:

> Once in a while they argue about the fastest game — basketball or hockey; then about the roughest game — water polo, football, or boxing. But when it comes to the top combination, the answer is lacrosse. Lacrosse is the all-star combination of speed and body contact. It requires more elements of skill than any game I know.[1]

Although this colorful description of lacrosse accurately portrays the speed and skill of the game, it is misleading and often misinterpreted, particularly regarding roughness. It is common to find in a magazine or newspaper article on lacrosse a reference to this roughness in either the title or theme of the story. Some examples are:

> "Massacre on a Muddy Plain," "Mayhem on the Lawn," "Moral Substitute for War," and "The Roughest Sport of Them All."

There is no doubt that lacrosse is a highly competitive sport involving contact and ruggedness. But the idea that lacrosse is "mayhem on the lawn" and "blood on the green" and therefore unsuitable for physical education and varsity activity is erroneous.

Injury potential

J. Roswell Gallagher of the Children's Medical Center in Boston commented on the extent of lacrosse injury, based on a survey of all injuries over a period of seven years at a boys' preparatory school:

> On the comparative basis of average number of injuries per participant per year, there is little difference between soccer, basketball, hockey, wrestling, baseball, and lacrosse... that baseball had more injuries than lacrosse may surprise those who have seen lacrosse played. It can be explained by the fact that lacrosse, as played in preparatory schools (at least in New England), is strictly refereed in an effort to keep injuries down, and because the obvious roughness is not of the kind which frequently produces injuries; to slash at your opponent's stick may seem dangerous to a spectator, but it only rarely injures a player. The number of eleven-man football injuries averaged more than eight times as many as for hockey and lacrosse....[2]

[1] Grantland Rice, cited in Paul Hartman, "Lacrosse Handbook." Mimeographed. (Columbus, Ohio: Ohio State University, c. 1967). Later published as Paul Hartman, *Lacrosse Fundamentals.* (Columbus, Ohio: Charles E. Merrill Publishing Co., 1968).

[2] J. Roswell Gallagher, Athletic injuries among adolescents: Their incidence and type in various sports, *Research Quarterly* 19 (Oct. 1948), p. 201.

A member of the Lacrosse Hall of Fame, Glen N. Thiel, had this to say:

> Contrary to the belief of the uninformed spectator, the injury factor is not great . . . statistics prove that major injuries are rare, confining injuries seldom occur, few practice hours are lost, though minor bruises and abrasions are common. To the author's knowledge, in all the long history of lacrosse, there never has been reported a fatality attributed to the game.[3]

Common injuries and their prevention

Most of the injuries that occur in lacrosse are of the minor contusion type. Unlike football, there is no tackling or piling on and most of the contact occurs in the open field in a one-on-one situation. Those injuries that are peculiar to lacrosse are usually caused by the stick on an unprotected part of the body. However, all of the vulnerable parts of the body (hands, face, shoulders, arms, elbows) are given adequate protection. Official rules require that every player in the game have a helmet, face mask, properly fastened chin strap, and gloves in order to participate. With the improved full face mask eliminating most facial cuts, few injuries occur on the protected parts of the body.

Occasionally an injury will occur due to a reckless swing of the stick by an overly aggressive player. However, there are rules and penalties to cover this kind of conduct. The potential for injury can be controlled by good officiating and ethical coaching. Close supervision by a coach on legal stick and body checking, and the proper attitude instilled in his players, will eliminate injuries caused by unsportsmanlike actions.

The unprotected parts of the body — knees, legs, and ankles — receive most of the injuries in lacrosse. These are usually the common injuries that also occur in football and soccer and are not due to lack of equipment. There are a certain number of "charley horses" and pulled muscles that will occur in the early spring when the weather is cold, particularly in northern schools. Strong emphasis on wearing warm clothes and warming up properly prior to playing will help alleviate most of these injuries.

Knee and ankle injuries often occur in lacrosse because cleats get caught in the ground and the knee or ankle is twisted. Many schools have switched from the football shoes to soccer shoes because of the shorter cleats which decrease the risk of locking the shoe in the turf. Because of the nature of the game, great stress should be put on running and conditioning exercises both before and during the season. This, plus careful maintenance of the playing field, should minimize knee and ankle injuries.

Intramural programs

Cadets at West Point are required to wear mouthpieces and have their ankles taped in addition to wearing the regular equipment prior to participating in intramural lacrosse. The officials are required to inspect each man prior to the game to ensure that he is wearing serviceable equipment. In addition, all cadets having a history of knee injury, concussions, etc., must receive a medical clearance prior to participation, and cadet trainers are assigned to each game. These measures are responsible for the low injury rate in 1967 intramural lacrosse: 460 cadets scheduled to play, 3,680 total exposures (each cadet one hour per day for eight days), 42 injuries (33 lower, 9 upper extremities), averaging to .011 injuries per exposure.

At the Air Force Academy, the intramural office considers lacrosse one of its safest sports. Injuries average two fractures a year, and the rest are sprains, strains, and various bruises.

The intramural program at Johns Hopkins includes lacrosse as one of its activities. The school provides helmets and gloves, and pays student officials to referee the games. Injuries have been minimal in this highly competitive program.

Physical education programs

In the physical education program at Johns Hopkins, a modified game is played without pro-

[3] Glen N. Thiel, Lacrosse as a high school sport, *Journal of Health, Physical Education, Recreation* 22 (Apr. 1951), p. 27.

tective equipment. The rules allow no body checking or poke or slap checking with the stick. It is legal to check with the head of the stick only on the opponent's head of the stick. Also, the dimensions of the field are abbreviated. There have only been a few minor bruises in the 15 years that lacrosse has been in the program.

Duke University introduced lacrosse, in combination with soccer, into its physical education program recently and it has been enthusiastically received by the students. The basic fundamentals are taught and practiced through drills and relays with just sticks and balls. Later, modified games, under close supervision by the instructor, are played on either the full field or half field. Rule changes are similar to those at Johns Hopkins, and there has been no injury problem.

Although lacrosse may appear to be a wild, free swinging, accident ridden activity, the rules we have today, together with good officiating, improved equipment, and ethical coaching, make the injury and accident potential almost negligible. Lacrosse can, and is, being safely played in the physical education and intramural programs, as well as on the varsity level.

References

Hartman, Paul. *Lacrosse Fundamentals*. Columbus, Ohio: Charles E. Merrill Publishing Co., 1968. 122 pp.

Consultants

James F. Adams, United States Military Academy, West Point, N.Y.

Charles J. Garver, United States Military Academy, West Point, N.Y.

James H. Keating, Jr., United States Air Force Academy, Colorado Springs, Colo.

Robert H. Scott, Johns Hopkins University, Baltimore, Md.

William G. Stiles, Hobart College, Geneva, N.Y.

Soccer | ROBERT GUELKER, M.S.

19

Soccer is played with skills involving the feet, thighs, chest, and head. The goalkeeper is the only person on the field who can legally use his hands on the ball, providing it is done inside the penalty area. Outside the penalty area, the goalkeeper is like any other player as far as using his hands.

Because soccer is a bodily contact game played with little or no equipment, and because it puts great demands on stamina, numerous injuries occur. The hazards most likely to cause injury are related to equipment, playing field, physical conditioning, and skills.

Equipment

The proper game equipment consists of uniform jersey, shirt, and stockings, in addition to shin guards and shoes. Other equipment can include protective supporting devices for injured areas. The goalkeeper can wear other equipment, and he should do so, especially in practice.[1]

Uniform

The rules on uniform specify that each team wear distinctive, colored jerseys. When it is difficult to distinguish teammates from opponents in making split decisions, players are apt to collide with their own teammates and cause injury. All teams should have two sets of uniforms to provide contrast, especially with jerseys and stockings. If economy is a factor, one pair of shorts could be used while the jerseys and stockings could be interchanged to avoid conflict. Many players react quickly by noticing the stockings of a teammate without looking up at the player's face or color of his shirt.

For safety of the opposition, the referees should check the players' shoes prior to each game to determine if the shoes comply with rule specifications. In order to have better footing on wet or muddy fields, some players will attempt to wear American football cleats, which are forbidden.

Shin guards

Because of the intricate and agile movements and the speed involved in soccer, many players today do not elect to wear shin guards. They believe this piece of safety equipment for the lower leg is burdensome and affects their play. There is no doubt a player has more mobility and quickness of start without the additional weight on his legs. However, the advantages of protection outweigh the disadvantages of wear-

[1] *The Official NCAA Soccer Guide* (Phoenix, Ariz.: College Athletics Publishing Service, 1967), p. 56.

ing the safeguard. There are a number of small, lightweight shin guards on the market that a player can wear without sacrificing too much speed and mobility. Shin guards are recommended for players of both teams when beginners are involved. Injury could develop because of the beginner's lack of skill, experience, and control of bodily movements. His poor timing can result in the kicking of an opponent instead of the ball. Also, it is advisable to wear shin guards when playing against an opponent who is reputed to play in a rough or overly aggressive style.

Supporting devices

Safety can be provided by wearing protective supporting devices over injured or weak bodily areas. Support can be given with expert taping or by wearing a suitable brace. A brace that allows lateral as well as frontal and backward movement is recommended for protection and support of weak knee joints. Some knee braces with metal hinges provide a good safeguard, but do not allow lateral movement of the knee. A coach should act under the advice of an expert trainer or physician before permitting an injured player to return to action, even with a supporting device.

Goalkeeper's equipment

Because the goalkeeper's method of training should involve different methods of practice, he can wear equipment to safeguard himself from injury, especially abrasions and contusions of the legs and arms. Since goalkeeper training involves the art of diving and falling to the ground from various positions and angles, the equipment should include pads to protect elbows, knees, and hips. Shorts with built-in padding are available. Baseball sliding pads can also provide protection for the hips and upper legs.

Because the goalkeeper can receive many abrasions and cuts during a training session, he should be encouraged to wear an old sweat suit in practice. While this minimizes abrasions, it also provides some safeguard protection if the goalkeeper fails to bring his padded protection.

In teaching a beginning goalkeeper how to dive, it may be necessary to provide him the safety of practicing in a jumping pit, on mats, or at least on soft ground with good turf.

Playing field

Safety can be provided by conducting all practice sessions and match games on nonhazardous fields. There should be no hooks or protrusions on the front of goalposts or the crossbar. The method of attaching the crossbar to the side posts should be checked prior to each game to determine whether there are any loose bolts or connections.

The playing ground should be free from all obstacles and hazardous conditions. Holes and gulleys should be smoothed and filled to minimize injury. Frozen footprints which result from playing on a muddy field should be eliminated, if possible, before the next game.

Many games are played on football fields. Holes left from field markers can cause a severe ankle injury to the player who steps on these small holes with a cleat. Safety could be provided by capping the holes and/or covering them with a piece of sod or fresh dirt.

Teams have conducted practice sessions and played matches on icy fields. For the safeguard of the players, the coach should postpone play or practice under these conditions. However, when such play occurs, it is safer to wear some type of gym shoe or training shoe than to wear shoes with cleats. Poor footing causes a lack of control of bodily movements.

Physical conditioning

Injury prevention can be attained through physical conditioning which permits optimal development of strength, endurance, and flexibility of those body areas most vulnerable to injury.

The types of injuries, and the body areas where these injuries are most likely to occur, are as follows:[2]

[2] Bob Bauman, Trainer, St. Louis University and St. Louis Baseball Cardinals. Jan. 15, 1969. (Interview)

1. Abrasions — all parts of the body, particularly the legs
2. Contusions — all parts of the body, particularly the quadriceps
3. Sprains — ankle and knee areas
4. Strains — lower extremities, especially the gastrocnemius muscle, the Achilles tendon, and the patillar tendon
5. Fractures — toes, metatarsal bones, and the fibula and tibia.

There is no magic formula to prevent these injuries from occurring. Once the environmental safety factors have been provided, the most important safety item for a player's well-being is proper physical conditioning.

Since soccer is a game of stamina, a player must be in top physical condition in order to set the pace of the game, otherwise, the opponent may set the pace. Once a player has fatigued and is unable to meet the physical demands made of him, he is susceptible to injury caused by poor timing and weakening of muscle strength. Conditioning a player for optimum performance involves constant training.

Regarding postseason conditioning, a player should watch his diet to avoid excessive increase in weight. Also, he should have at least a minimal amount of exercise to maintain muscle tone. As a consequence, preseason conditioning will be easier, and there will be less danger of injury. Walking, jogging, participation in basketball, volleyball, handball, and tennis matches provide beneficial exercise. Because of the fresh air and walking involved, golf is a good summer and off season activity.

Preseason conditioning concentrates not only on skills, but also on preparation of a player to withstand any work load that might be imposed upon him by the coach when the regular season's training begins. Besides developing his cardiorespiratory faculties, the player should develop all muscle groups of his body. Emphasis should be directed at developing weak areas, especially the ankle and knee joints. Preseason training can include calisthenics involving numerous flexibility exercises; running forward and backward without the ball; running with the ball and performing skills individually; working on skills in small groups with the ball; play in abbreviated games of three to five players on each side; and wind sprints. Running should be done in stints of short duration for a specified number of times, as opposed to running laps.

Figure 1. Proper performance will avoid headache.

In-season conditioning involves the work load and type of activity needed to meet the demands of playing the game. Generally, a player's work load in practice should exceed the requirements of the game. Thus, all players should be sufficiently fit to play extra time without a negative change in performance.

Because the game demands much stopping, starting, turning, and jumping, it is vital for a player to train daily, simulating movements used in match situations.[3] Drills with and without the ball can be utilized in providing these necessary movements; most game situation drills will accomplish this purpose. An example of a dribbling drill which meets this objective is: as player A makes feinting and dribble movements as he would in a game for a stretch of 30 yards, B makes no attempt to take the ball away, but retreats while forcing A to move side to side. When they reach the designated mark, the players can switch off and alternate.[4]

This drill can be varied by player B attempting to take the ball away and forcing A to protect the ball with his body.

Warm-up

It should be noted that the warm-up has real preventive values in conditioning and before playing a game. Its purpose is to sufficiently loosen and stretch the various muscles and ligaments and other collogenous tissues. This reduces muscle tears and ligament strains. The warm-up should include easy running, stretching, and general body conditioning exercises. Pregame warm-ups should include ball control drills with moderate movement. The warm-up should be climaxed by a few wind sprints.

Skill

The objective of all soccer players is to develop skill in playing the game in order to improve performance. Skill definitely is a goal when a person is conditioning for preseason and in-season play. Regarding in-season work, the coach is responsible for the type of activity used in the development of skills. In addition, each player should use those moments available to him before and after practice to work on improving his skills. The player with the best bodily control, who knows how to protect himself in intricate play situations, will be the most successful at minimizing injury.

[3] Walter Winterbottom, *Soccer Coaching* (London: Naldress Press, 1952), p. 7.

[4] Dettmar Cramer, International Soccer Coach of the Federation of International Football Associations. Aug. 1968. (Interview)

References

The Official NCAA Soccer Guide. Phoenix, Ariz.: College Athletics Publishing Service. Annual.

Winterbottom, Walter. *Soccer Coaching*. London: Naldress Press, 1952.

Consultants

Bob Bauman, St. Louis University and St. Louis Baseball Cardinals, St. Louis, Mo.

Dettmar Cramer, Federation of International Football Associations, Zurich, Switzerland.

Volleyball | JAMES EUGENE COLEMAN, A.B.

Each year 40 to 60 million persons in the United States engage in some form of volleyball. Participants range from school girls in class, to executives at the company picnic, to Olympic athletes. The game can be fun for all ages and skill levels.

Volleyball is probably one of the safest team activities. Injuries occur at a rate which would be expected for the age, physical condition, and competitive spirit of the individual.

With increasing emphasis being placed on international style and power volleyball, greater hazards have been introduced into the game. Diving, rolling, and over-the-net blocking have created a stronger need for training and conditioning to offset the potential for injury. Most injuries occur when the participant attempts to extend himself beyond the limit of his conditioning or skills.

Volleyball injuries fall into two broad, overlapping categories: disabling injuries and nondisabling injuries.

Disabling injuries

The following injuries usually remove a player from competition immediately.

Ankle injuries. By far the most common and the most serious. Numerous volleyball players were lost by all countries in the 1968 Olympics because of ankle sprains. These injuries are generally caused by a player landing on the foot of a teammate or an opponent or collision with court equipment.

Knee injuries. Result from collisions but are usually only aggravations of old injuries. Unwise training techniques can have adverse effects on knees.

Major bruises. Caused by collision with equipment or with other players. Greater emphasis on diving and rolling has created a serious hazard for the poorly trained athlete.

Leg cramps. Usually caused by poor conditioning or exhausting playing conditions.

Nondisabling injuries

These injuries often impair the effectiveness of the athlete but seldom incapacitate him.

Finger, thumb, and wrist injuries. Very numerous — usually caused by poor techniques of playing the ball. A good tape job can alleviate many of these injuries. Greater emphasis on the forearm pass has reduced the number of hand injuries, whereas the over-the-net blocking has increased hand injuries.

Shoulder, elbow, and lower back injuries. Can be traced to improper warm-up, poor conditioning, or improper playing techniques. These ailments also plague baseball and tennis players.

Minor abrasions. More common today because of increased emphasis upon aggressive diving and rolling on defensive. Many abrasions are minimized by use of long sleeved jerseys and hip, coccyx, and knee pads.

Unfortunately, many good physical education facilities are still cluttered with unsafe volleyball equipment. Pipes under nets, crank handles, winches, tires and wheels supporting net posts, cables, officials' stands, chairs, and walls threaten the skilled aggressive athlete. Hard floors are bad for good volleyball players.

Beginning volleyball players create hazards by failing to observe rules and by overcrowding; they sometimes play without adequate officiating and this constitutes a hazard.

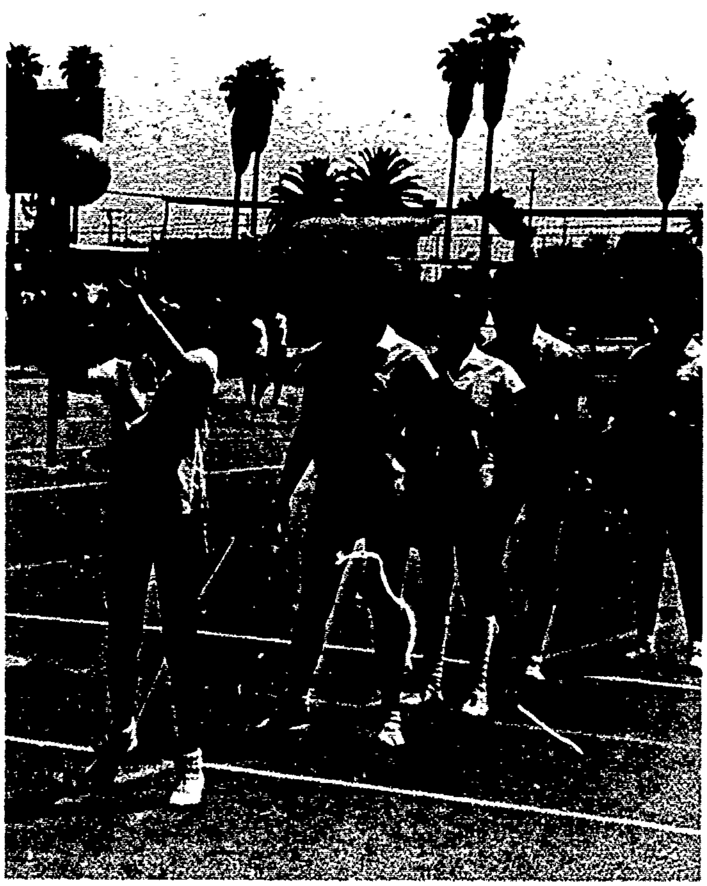
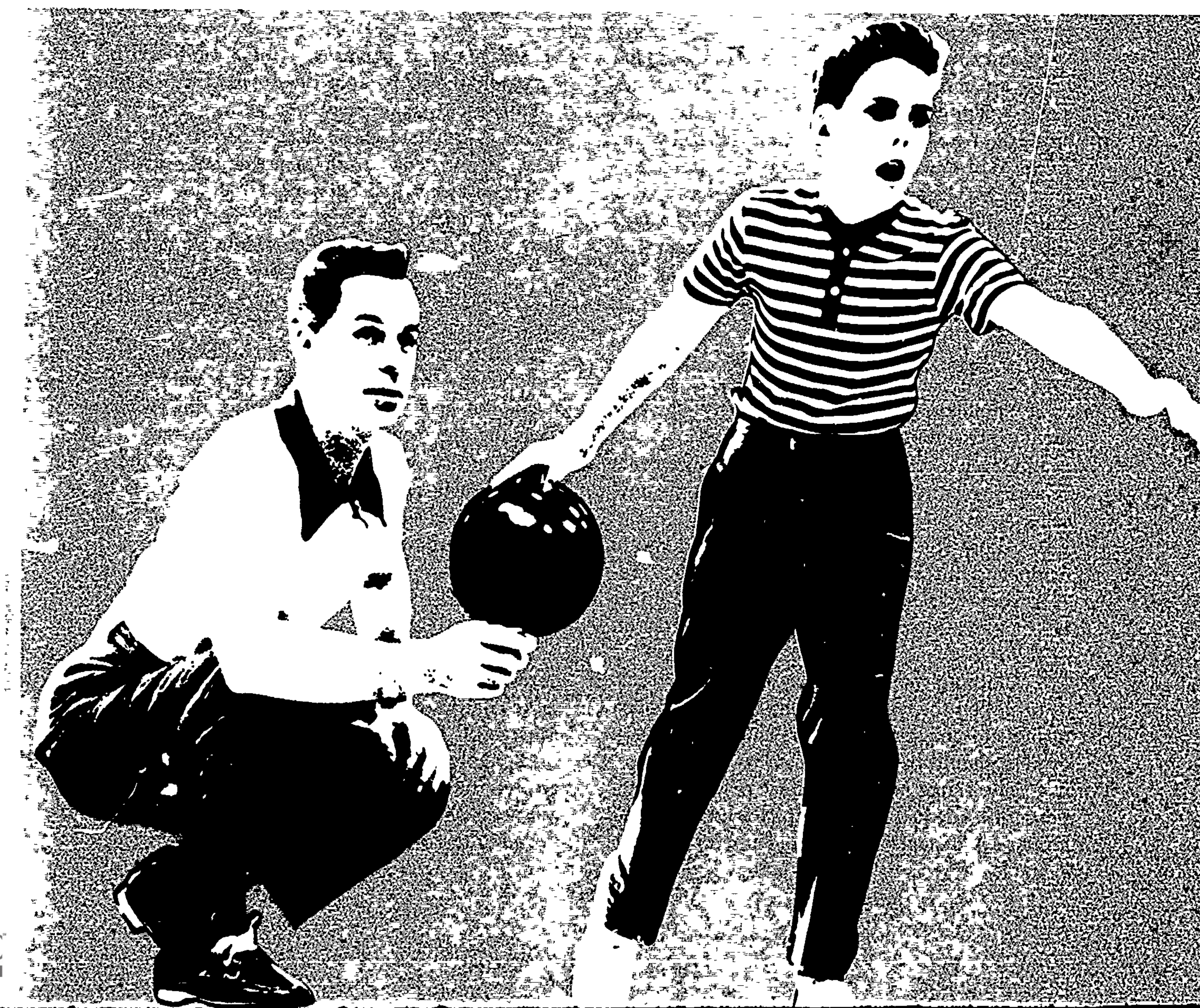


Figure 1. Finger, thumb, and wrist injuries can be reduced with proper instructional techniques.

SAFETY IN INDIVIDUAL SPORTS



Archery | BEN BRUCE, M.S.

21

Archery has potential hazards, such as being hit by an arrow or from parts of broken or damaged equipment, injury to the forearm and stringslap, abrasion of the bow hand by the arrow, and irritation to the fingers of the drawing hand. However, with good instruction, proper and well cared for equipment, and a well supervised range, both men and women can enjoy the sport free of injury, regardless of age or physical ability.

Elimination of hazards

To eliminate the hazards in archery, the following precautions should be followed:

1. Develop a safety attitude with a personal sense of responsibility for others as well as oneself.

2. Allow students to shoot only if they are equipped with an arm guard to protect the forearm from the slap of the bowstring and a finger tab or glove to protect the fingers from friction of the string.

3. Clothing should not have pockets, buttons, or ruffles on the left (for a right-handed shooter) to prevent snagging the bowstring. No jewelry or pins should be worn.

4. The range should be clear of all obstructions with adequate distance or backstop behind targets. A distance twice the number of yards at which one is shooting, with a minimum of 50 yards, should be kept clear behind the target.

5. Use only equipment that is in perfect condition. A constant check should be made of the bow, arrows, and string to prevent the use of defective or cracked equipment.

6. Equipment should be matched. A heavy bow will cause a low spined arrow to crack.

7. A bow without an arrow should not be drawn. This may result in over drawing the bow, causing breakage.

8. Pay particular attention to bracing the bow. If the loop of the string slips out of the nock, the bow snaps back hitting the archer. Twisting the bow can also cause damage.

9. The fistmele (distance from belly of bow to string when strung) should be correct. If it is too little it will cause wrist slap and if it is too great it may result in bow breakage.

10. Bows and arrows should be placed on a bow rack or in the ground quiver rather than on the ground.

11. Arrows should be checked for possible abrasive effect on the bow hand. Glue deposits, loose fletching, and cracks or splinters are sources of trouble.

12. Only one person at a time should draw arrows from the target. Others should stand at a safe distance to prevent being hit by an arrow pulled with force from the target.

13. Arrows should be drawn from the target properly. Any bending may cause the arrow to crack or splinter.

14. Treat a drawn bow as a rifle — it can be just as lethal.

15. All shooters should be on the line before the signal is given to nock arrows.

16. No one should step across the line to retrieve until the signal is given. Should an arrow fall short or fall off the bow, no effort should be made for a retrieve until the signal to cease shooting is given.

These guidelines apply specifically to target shooting and generally to other archery activities such as clout, field shooting, and hunting. The key to safety in each of these activities lies in proper supervision of the range by the instructor.

Figure 1. Proper Instruction and well cared for equipment can make archery an accident free activity.

Bowling | RICHARD S. YOUNGBERG, M.A.

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Bowling is one of the safest of all sports when the rules of etiquette are followed and when bowlers know how to select the proper equipment.

Aside from checking his bowling shoes for the right size, a participant needs to look carefully at the bottom of his shoes. If the bowler is right-handed, the left shoe should have a smooth leather bottom so that the bowler will slide on the last step of the approach. The right shoe for a right-handed bowler should have a rubber bottom. Special caution needs to be taken by the left-handed bowler to make sure he has been equipped with the proper shoes.

The ball should be selected with care, especially for a beginning bowler. The weight of the bowling ball should be relatively light for the beginner. After learning the basic techniques, the beginner can switch to a heavier ball. Even more important than the weight of the ball, however, is the fit. A ball that is "too loose" or has too wide a span may be dropped before the ball should be released. The same is true for bowling balls with little inward pitch. On the other hand, a ball that is "too tight" or has a narrow span, or a lot of inward pitch is apt to to be lofted. The advice of a qualified bowling instructor should be sought to insure proper ball selection.

A participant should check his street shoes to make sure he is not tracking in grit or water when he walks to his lane. He should change into his bowling shoes before placing his ball on the ball rack. Next, the approach of the lane should be inspected with care to see if there are any wet spots or areas where dust and grit have accumulated. Before throwing his first ball, the bowler should test the approach to make sure there are no slippery or sticky spots. A few practice slides on the approach without the ball will accomplish this.

Care needs to be exercised when the ball is removed from the ball rack. The ball must be turned, *not spun*, until the holes are pointed upward. Both hands should be used to lift the ball from the rack, and a line drawn between the hands must be at right angles with the length of the ball rack. The latter precaution needs to be taken so that a bowler's fingers will not be injured by other bowling balls returning to the ball rack. A bowler should reach his starting position on the approach before inserting his fingers into the bowling ball.

Bowlers on two adjoining lanes should not deliver their bowling balls at the same time. In case two bowlers are on the approach at the same time, the one on the right should go first. After delivering the bowling ball, a bowler must remain in his own lane. Also, he should be careful to observe the foul line.

Bowling can be made a lot safer if participants obey the rules of etiquette. These rules are posted in most bowling alleys. Learning the fundamental skills for bowling from a competent instructor can improve one's safety as well as one's score.

References

Casady, Donald and Liba, Marie. *Beginning Bowling.* Belmont, Calif.: Wadsworth Publishing Co., 1962.

Kidwell, Kathro and Smith, Paul. *Bowling Analyzed.* Dubuque, Iowa: William C. Brown Co., 1960. 110 pp.

Sullivan, George. *The Complete Book of Family Bowling.* New York: Coward-McCann, Inc., 1968.

Figure 1. Proper instruction, a well-fitted bowling ball, and proper shoes are important for beginning bowlers.

Equitation | JACK C. HUGHSTON, M.D.

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Accident prevention and safety in equitation consist of a fine balance among the rider, horse, and equipment.

Rider

The inexperienced rider should begin on an experienced, calm horse (a "school" horse for beginners) under qualified supervision. As the ability of the rider increases, a less experienced and skilled horse can be used with a reasonable degree of safety. Rider ability can be improved to a level where the rider can train "green" horses safely. A person with normal intelligence and some athletic ability can become an experienced rider by hard work.

Horse

A desirable horse has average intelligence, is not awkward, and has a good disposition and good eyesight. A stupid horse cannot learn to keep himself and the rider out of trouble. A clumsy horse can cause falls because he "gets in wrong" at ditches and jumps. An uncooperative, ornery horse can cause much displeasure, as well as danger. A horse with an inherently cooperative personality can be made uncooperative and fractious by continually being punished through improper riding techniques. The most common punishment for a horse is "bad hands" on the part of the rider; this practice produces an almost persistent irritation to the horse's mouth by pulling on the reins at the wrong times. Such improper treatment is the reason for constant reschooling of those horses used for teaching beginners.

An overfed (particularly with grains) and under-exercised horse is naturally "hot." The horse that is kept "at grass" and with a field of sufficient size in which to exercise tends to be less troublesome, even though ridden only occasionally. Any horse which has not been ridden for a period of time should be worked on a lunge line for a short period immediately prior to mounting and riding. Grooming of the horse before riding also has a quieting influence. The horse's feet should be checked and cleaned prior to each ride.

The approach to the horse for any purpose should always be from the front or side, never from the rear where there is danger of being kicked. When grooming and when walking to the rear of the horse, one should stay close to the horse's body. Then, even if he should kick, he would merely push the rider out of the way.

Equipment

The type of equipment needed is directly related to the ability of the rider and the training of the horse.

A youngster riding bareback must encircle his legs around the horse's waist (just behind the shoulder) in order to secure his position. The horse accustomed to this manner of riding who has a quiet disposition and is kept at grass is a perfect companion. The bridle and reins need be nothing more than a piece of rope, and the bit a leather thong such as the Indians use, or a hard piece of straight rubber. For an agile rider, no ride could be more enjoyable or safer. However, the situation is usually more complicated, and thus further recommendations follow.

The bridle should be of proper size and fit for the horse. If it is too loose, it may fall off; if too tight, it will irritate the horse. The bit should be adjusted so that it causes only a slight wrinkle at the corner of the mouth, and should be no more "severe" than what the rider and horse have become accustomed to. The reins and leather of the bridle should be in good condition, for a break in either under the stress of a good gallop can cause loss of control and disaster.

The type of saddle is of minor importance. Certainly, for long rides, the rigors of polo or wrangling, or for the duration and stress of a fox hunt, it should be comfortable, of suitable size to the rider, and built for the type of riding for which it is being used.

More important than the saddle itself are its accessories. The stirrup straps should be in good condition and attached to the saddle in such a way that the saddle will readily come loose in case of a fall. A stirrup strap broken on landing on the other side of a jump or on making a sharp turn on a cutting horse, or under most circumstances, can prove disastrous and produce a dangerous fall for an unwary or nonagile rider.

The stirrup should be well constructed, free of breaks or cracks, large enough so that the foot cannot become hung in the stirrup, and suitable for the occasion. The girth and its buckles need to be inspected for wear and tear prior to putting on the saddle. Once the saddle is fixed in place, the girth should be sufficiently tight to allow mounting without the saddle turning on the horse and throwing the rider upon the ground. Once the rider is mounted, the tightness of the girth needs to be rechecked, as the weight of the rider frequently produces looseness. If one has been riding for an hour or two, the circumference of the horse has become less with the exercise and the girth needs to be checked for looseness, and then tightened if necessary. Inadequate girth tightness during and after mounting accounts for a large percentage of rider injuries. The billet straps, which attach the girth to the saddle, also should be inspected.

Personal equipment for the rider depends upon the occasion. A wrangler needs his chaps to protect his legs from the undergrowth. A fox hunter needs his boots so that the stirrup leather, resting against the shin bone for security, will not bruise the leg. A polo player frequently is aided by knee guards to prevent injuries on bumping. A pony clubber, a fox hunter, and a show jumper need to wear a hard hat to prevent head injuries from falls and for protection against tree limbs. The polo player needs a hard hat for protection from the ball and mallet. The range rider needs a light, wide brimmed hat for protection from the hot sun in open spaces. Heels are needed on boots to prevent the foot from slipping through the stirrup. (Avoid rubber soles, as they are particularly dangerous.)

Injuries

The majority of serious injuries incurred in horseback riding fit into three categories.

First, it is the inexperienced rider who buys a country place and a horse and then puts the horse out to pasture. The owner goes to the country every few weeks and on one weekend decides to ride the horse. The rider is either frightened or overconfident. In either case, the horse gets going at too great a speed and the rider falls, or the girth isn't fastened and the rider falls, or the stirrup straps are not inspected and they break.

Second, a youngster is having a birthday party. The mother thinks it would be nice for all the children to ride around on a horse as a part of the entertainment. She knows a neighbor who owns a horse, but she does not know the horse and usually does not know the essentials of safety in riding. The most frequent cause of the resultant broken wrist or broken arm is a loose girth, which allows the child to roll off the horse, even at a walk.

The third example involves teenagers who rent horses from a riding stable which rents horses by an hourly rate to anybody who wants to ride, without inquiring about the person's riding ability, and where the rider does not know enough to ask any questions about the horse and equipment. The result is usually an inexperienced rider on a horse that is accustomed to galloping vigorously for the entire hour, or on a horse accustomed to turning back and heading for the barn at the first opportune moment. Such horses are often untrained or incorrectly handled, and frequently the riding equipment is in poor condition.

In well organized riding schools, the incidence of injuries is almost nil. When they do occur, they are usually minor. The supervision, teaching, health, care, and quality of the horses are excellent. The training of the rider is graduated and cautious. The equipment is in good condition.

Despite the infrequency of injury, the high cost of liability insurance is a primary prohibitive factor in the establishment of quality riding academies. It is extremely difficult to make ends meet financially when this cost of liability coverage is added to the expense of running such an establishment. For more detailed information, see the weekly periodical *The Chronicle of The Horse*, Middleburg, Virginia; it covers almost every phase of horse activity and is interesting reading.

Fox hunting, show jumping, pony clubs, one day events of the United States Combined Training Association, and general horse shows seldom involve injury. Why are injuries in these areas so infrequent? The answer lies in the proficiency of skills attained by the riders and horses participating in these activities.

References

Benoist-Gironiere, Yves. *The Conquest of The Horse.* New York: Wilfred Funk, Inc., 1957. 154 pp.

Chamberlain, Harry D. *Training Hunters, Jumpers, and Hacks.* 2d ed. New York: D. Van Nostrand Co., Inc., 1969. 329 pp.

Cooper, John E. *Steeplechasing In America.* 17th ed. Garden City, N.Y.: Doubleday & Co., Inc., 1964. 151 pp.

Mackay-Smith, Alexander (ed.). *The Chronicle of the Horse.* Berryville, Va.: The Blue Ridge Press. Weekly periodical.

The Pony Club Organization Committee. *Horsemanship for The Pony Club.* London: The British Horse Society, 1956. 174 pp.

The United States Pony Clubs, Inc. *The United States Pony Clubs, 1965 Tenth Annual.* Cambridge, Mass.: Howard A. Doyle Printing Co., 1965. 124 pp.

Wright, Gordon. *The Cavalry Manual of Horsemanship and Horsemastership (The Official Manual of The United States Cavalry School at Fort Riley).* Garden City, N.Y.: Doubleday & Co., Inc., 1962. 180 pp.

Golf | RICHARD S. YOUNGBERG, M.A.

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Golf, like many other noncontact sports, is not considered particularly dangerous. Safety should not be overlooked, however, since serious and sometimes fatal injuries can result if a golfer is struck by a golf ball or club. Golfers can best protect themselves from injury by obeying the rules of etiquette and using common sense.

If not cautious, a golfer may injure himself, another player, or a caddy before joining his playing companions on the first tee. Practice shots should be confined to the designated practice area. If a player uses a shagger while practicing, the shagger should (1) know how to shag, (2) not be in danger of being struck by golf balls hit by other golfers, and (3) not face the sun while shagging. Some golf courses have protective devices for a shagger to wear. If such a device is available, the golfer should make sure that the shagger uses it. The golfer who is practicing should also help assure his own safety and that of other practicing golfers. Allowing sufficient room to other players on the practice tee and standing on a straight line with those players already practicing are two important precautions.

On the first tee a player should restrict the number of practice swings he takes and should only take them when it is his turn to play. Since it is necessary to know where the other members of the foursome are standing whenever a player swings a club, it is helpful if the remaining members of the foursome stand together. If the person shooting is a right-handed golfer, those watching should stand to his right side and behind the ball. A safe distance of 15 feet should be maintained between the person swinging and those watching.

Because distances may be deceiving on an unfamiliar course, the player must make absolutely certain that the group ahead is out of range before hitting. On dog leg or blind holes, extra caution is needed. If possible, a caddy should be sent ahead to check if the way is clear. The caddy should never stand in the fairway to mark the point of aim on such holes, however. This practice is not only unsafe but illegal.

Golfers should play without undue delay. If a group is delayed it should allow those playing behind to play through. Before the group playing through hits, the group ahead should step aside to a protected spot off the fairway. The group playing through should be out of range before play is resumed.

The person with the honor should play first, and only one person should hit at a time. This is one of the most basic rules of etiquette, yet one that is often violated.

A golfer needs to be aware of workers on the course as well as other golfers and caddies. Workers should be warned before a shot is hit in their direction and the golfer should wait for a worker's acknowledgment before hitting.

The other members of a foursome should be warned before a golfer plays a shot from an area where there are trees or large stones. In such situations a ball can easily ricochet and injure someone. The player making the shot should likewise consider his own safety, especially if there is a chance of the ball bouncing back at him.

Shots from a sand trap near the green can be among the most dangerous shots in the game. Even the most skilled golfers can shank or skull a shot from a trap, thus playing companions and caddies need to protect themselves. When a right-handed golfer hits from a sand trap, the only safe spot on the green is behind and just to the left of the hitter. A ball could be skulled to the area adjacent to the hole and shanked to the area at the right side of the green.

A foursome should leave the green as soon as it putts out, and scores for that hole should be recorded on the next tee. To help ensure speedy play and safety, golfers should leave their golf bags between the green and the next tee. Players hitting to the green should not proceed until all members of the foursome are well on their way to the next tee.

Par three holes present a unique safety problem. On some courses it is suggested that players on the green allow those on the tee to hit

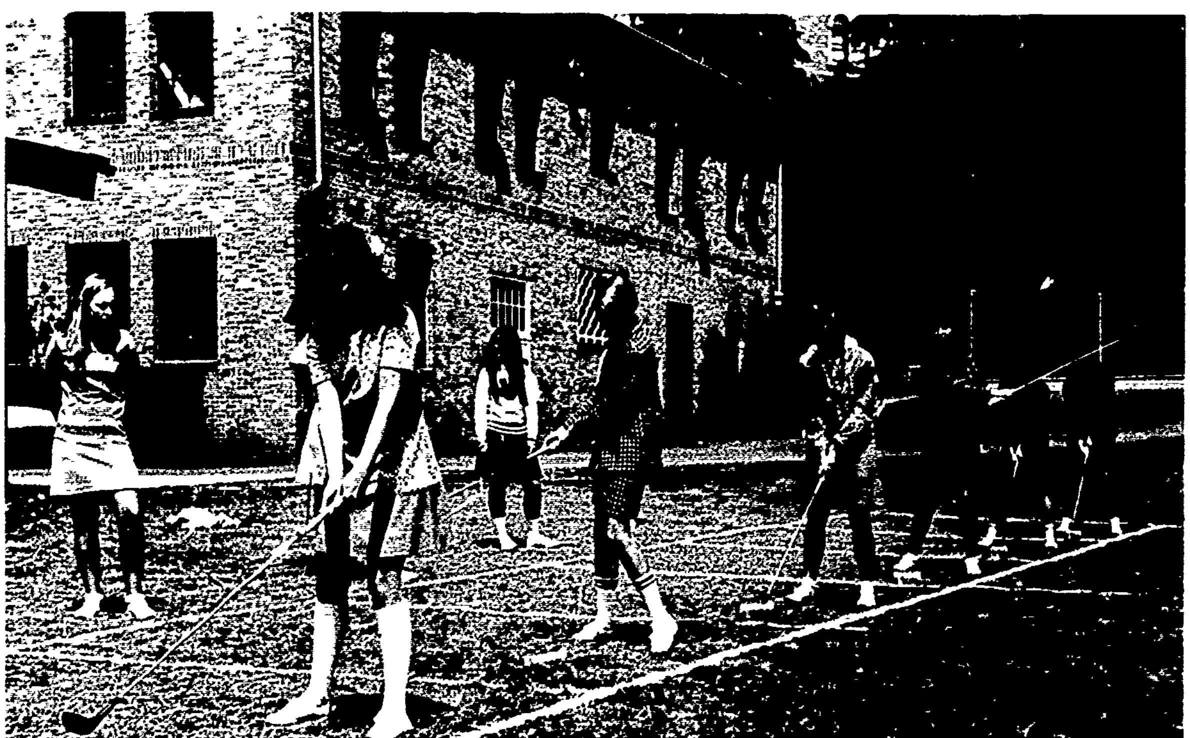

Figure 1. Avoid getting "clubbed."

so that play may be speeded up. The time saved by this procedure, however, does not seem to be worth the risk. Players on the green may be looking into the sun and not be able to watch the flight of the ball. The color of the sky or an individual's eyesight may make it nearly impossible to spot a ball hit from the tee.

When a ball is traveling toward a player or group of players the word fore should be shouted loudly so that the people endangered are warned. Unfortunately, shouting *fore* sometimes has the opposite effect of a warning, since many golfers do not know how to react correctly. In an attempt to spot the oncoming ball many golfers look toward the direction of the yell. This exposes a player's face and eyes to the ball. The correct reaction is to turn away from the direction of the sound and lower the head. A player still may be struck, but he is less apt to incur serious injury. If a golfer is near a tree when he hears *fore*, he should position himself so that the tree is between him and the area from which the ball is coming. Similarly, players should duck behind a golf cart or golf car when possible.

Golfers must learn how to deal with the weather. A hat should be worn to protect a golfer's head from the direct rays of the sun. Golfers should not play during lightning storms. If on the course when the storm begins, golfers should not carry an umbrella over their heads in an open area. Steel shafted clubs may also attract lightning and must be kept in the golf bag for protection. If a building is not available for shelter, the golfers should seek natural protection in a depression or a deep valley. A dense group of trees will afford some protection, but isolated trees are to be avoided.

Automation has placed another potential safety hazard on the golf course — the golf cart. Players using them should read the directions carefully before starting them. In no case should these cars be taken over rough terrain or steep slopes.

References

American Association for Health, Physical Education, and Recreation. *Ideas for Golf Instruction*. rev. ed. Washington, D.C.: The Association, 1968. 30 pp.

Bruce, Ben and Davies, Evelyn. *Beginning Golf*. Belmont, Calif.: Wadsworth Publishing Co., 1962.

Nance, Virginia L. and Davis, Elwood C. *Golf*. Dubuque, Iowa: William C. Brown Co., 1966.

National Golf Foundation. *Easy Way to Learn Golf Ruies*. Chicago: The Foundation, 1970. Revised annually. 80 pp.

Gymnastics

GEORGE SZYPULA, M.S.

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Gymnastics has a uniquely different problem in accident prevention from most sports. Whereas most athletes have a problem of dodging other players and objects in the game, the gymnast propels and maneuvers his body on and from apparatus as well as from mats. His degree of effectiveness and awareness is directly related to avoidance of injury.

FACTORS IN ACCIDENT PREVENTION

Class control

Class control without regimentation is one of the best means of preventing accidents. Basic skills are practiced until performed adequately. Then elementary variations of basic skills are done until they are passed. Intermediate level skills can be done by advanced performers. Even though the problem of injury avoidance lies with the gymnast, he should be carefully instructed and supervised by a teacher or student leader.

Pupils with psychological and emotional problems should be recognized and their work controlled. Pupils with physical problems—obesity; lack of flexibility and coordination, weakness—are more readily observed and helped.

Equipment

All apparatus should be inspected daily. Recommendations of leading equipment companies should be followed. Only instructors or leaders should adjust the equipment.

Performers should wear gymnastics shoes. Girls should wear leotards or gym suits which are not loose fitting. Boys should wear shorts and "T" shirts.

Officiating and testing

Gymnastic regulations specify that in competition the gymnast should perform only those skills which he has under reasonable control. Poor gymnasts and coaches often overlook these regulations in an effort to win through recklessness and daring. Many times students interested in a grade disregard the consequences and take a chance on doing a skill for which they are poorly prepared. Competent judges who deduct severely for performances that are sloppy, hazardous, and uncontrolled can do these gymnasts a service.

Fatigue

Fatigue is a factor in accidents. A beginner in gymnastics first does one skill. As he repeats it over and over in an attempt to master it, he becomes fatigued with a resultant loss of coordination. Injury might result if his teacher does not recognize the symptoms and terminate the workout. As the student progresses he learns skills in combination which gradually expand into routines, and fatigue again becomes a factor. This is especially true on a dismount. At the end of a routine, a simple jump off the apparatus on which a beginner has been practicing is preferred until greater endurance and skill are developed.

Spotting

Spotting (assistance) is a major factor in successful performance. It is done to give a gymnast the feel of a skill or to help him through

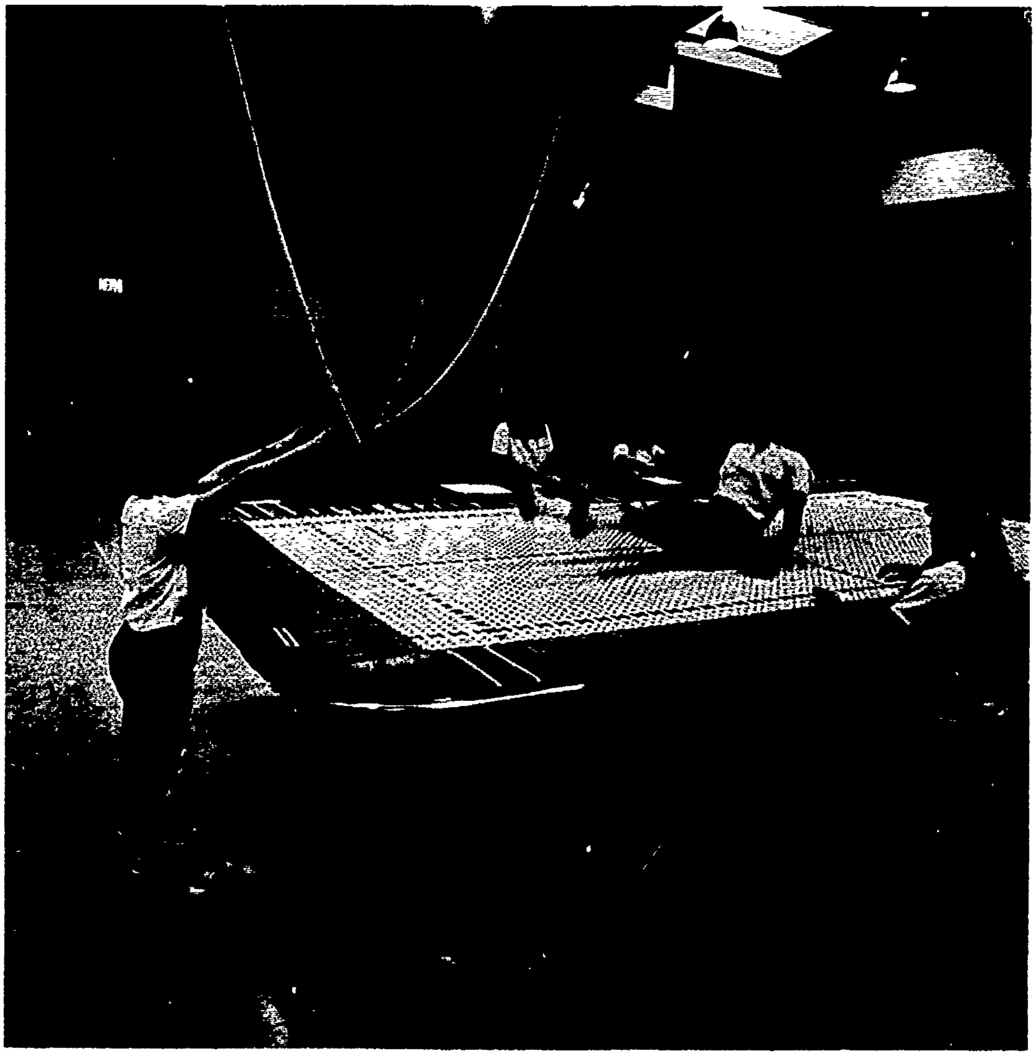

Figure 1. Adequate, attentive spotters and proper instruction will make trampolining a safe and enjoyable activity.

if he is unable to complete a skill. A performer should be assisted until he has learned a skill thoroughly, then the assistance gradually removed. Sudden removal might make him freeze and partially complete a skill. A student should not be pressured to perform without spotting. A spotter should know exactly what the gymnast is going to do. If he is not alert, the gymnast might receive injury from a bad performance.

Spotting is easier when bars and rings are low. The gymnast can bend his knees on swinging skills. Bars and rings can be raised if the spotter can stand securely on a platform or chair without obstructing the performer. A student should learn spotting skills as diligently as he learns gymnastic skills.

Falls

A gymnast must learn how to fall. When falling out of control, he should always try to fall to his hands. If he falls forward toward his chest or face, he should land on his hands with arms straight to absorb the shock and then bend them in a controlled manner. If he falls head first, either forward or backward, he should land in a momentary handstand, absorb the shock, and roll out forward or backward. If he falls to his seat or back, he should round his back, put his chin on his chest, and place his hands down with fingers pointing forward. If he falls backward toward his neck, he should reach backward with his hands, land on them, and gently lower his body if possible. If there is time when falling backward, he should twist around to fall forward.

Falling techniques can be practiced on a landing mat of polyurethane about six inches thick, or on a trampoline from a low position, or into a pole vault landing pit.

EQUIPMENT AND EXERCISES

Tumbling and balancing

In physical education at all levels, participants should do warm-up exercises, such as pretzel bends, backbends, and certain calisthenic activities followed by forward and backward rolls and cartwheels. Later, squat-headstands, squatstands, and headstands can be done. Each lesson should conclude with strength exercises — pushups, situps, and partial squat jumps. The only apparatus required for free exercise is a floor mat, which should be clear before using. The exercises are designed to develop balance, strength, and flexibility. Later, doubles tumbling and balancing skills can be presented.

Trampoline

Trampoline seems to be the most hazardous gymnastic equipment since a beginner is able to propel himself before he has learned body control. On other apparatus and in tumbling he must first attain body control before performing handsprings or somersaults off the mat or handstands on the apparatus. To be safe, a beginner should start with basic drops: seat, hands and knees, *front and back*.[1] Sweat clothes should be worn to avoid abrasions. Pads should cover the frame and mats should be placed on the floor near the trampoline, with six or eight spotters around the ends and sides.

Blind children or those partially sighted can have an enjoyable experience on the trampoline or tumbling. Their work, of course, must be supervised carefully and not extend beyond basic skills.

Parallel bars

Bars should be waist high. A mat, cut to fit the uprights, should be placed between the bars. On both sides and at both ends there should be mats 5 feet by 10 feet and 3 inches thick, if filled with hair, or 2 inches thick, if filled

[1] George Szypula, *Beginning Trampolining* (Belmont, Calif.: Wadsworth Publishing Co., 1968).

with polyurethane. At a point where a gymnast might hit one of the bars with his body or legs when dismounting or doing turning skills, a mat or padding tied around the bar can soften the impact. Chalk in block or powder form should be applied to the hands to prevent slipping.

The same fundamental hanging positions apply here as on the horizontal bar and rings. All should be done slowly in the middle or on either end. Spotters should grasp the legs. Next is an arm support above the bars with a straight body or with legs raised to horizontal. In a support at least 10 dips should be done.

The hand walk across the bars is next, followed by a straddled legs travel, then body swings. Skills in a hand support should be spotted by the upper arm. At the end of the rear swing, a gymnast can do a front vault dismount and at the other end a rear vault dismount. These are spotted by the upper arm on the side to which the gymnast is dismounting.

The next skill is a shoulderstand from a straddled sit. It is like a headstand and is spotted the same way. To keep from falling between the bars, the performer should keep his elbows out. A mat placed across bars will stop him if he should fall over. A performer should be assisted into the balance and brought carefully back to a straddled sit. The same procedure is used for a handstand except the gymnast can stand on the bars and kick into the balance. Four spotters should be used: two to get him up and help him balance and two behind to keep him from falling over. If the performer is going below bars from above, the spotter should quickly shift his hands below the bars. In this way, the performer will not fall on his arm.

An upper arm kip should be done on low bars. The performer's legs should be stopped when he gets to a support. Forward and backward uprises should be done on higher bars. The spotter should grasp the gymnast's thighs, lift him up, and steady him.

A youngster with handicapped legs can work parallel bars because he usually has strong arms and upper body. He must be helped off the apparatus.

Horizontal bar

The bar should be set at chest height of the average pupil. A mat 7 feet by 30 feet by 4 inches should be under the bar.

A beginner should not use the bar until he has done basic skills, such as hang and swing in an "L" position, bent inverted hang, knee hang, "skin the cat," and pullups. He should be assisted even on pullups if necessary. Handguards should be used to avoid blistering and tearing skin.

On the horizontal bar, a gymnast can do hip and single knee circles. A small pad wrapped around the bar can protect his knee when he does the circles. Next he can swing on a higher bar and be stopped before he dismounts. If he dismounts while swinging, the dismounting should be low and at the back end. A spotter should encircle his body and catch him if he releases before the peak of his back swing.

Uneven parallel bars

Under normal supervision, elementary and secondary school students can work one of the uneven parallel bars, placed chest high. Elementary school students can work both of the bars if they are supervised carefully. The teacher should divide the children into squads of seven and remain close to the apparatus. While one unit is working the bars, the other units can engage in gymnastic activities that are easily monitored. Pulling over backward from the low bar over the high bar into a support is probably the ultimate skill for beginning classes.

Balance beam

A beam should be 16 feet long and 2 feet high for beginners. Only limited skills can be performed by novices on a beam one foot off the floor. At this height, however, advanced gymnasts can do cartwheels, rolls, high leaps, handstands, and dismounts. As a gymnast walks, runs, jumps, turns, sits, and rises, two spotters can walk alongside with an arm raised so that if the gymnast should fall sideward, he can grasp a hand.

Side horse

Even though a side horse is low, mats three inches thick should be placed around the horse but should not overlap. Before attempting leg circles on the horse, a gymnast should be able to support himself easily. If he has not yet mastered this ability, he should limit himself to dips on parallel bars and pullups on horizontal bars.

Children with handicapped legs can find success on the horse, parallel bars, and in rope climbing. They must be helped off the apparatus after performing.

Rope climbing

Pupils who lack strength or fear heights should not be forced to climb to the top of a rope. They might have trouble climbing down or even fall. The descent must be controlled or rope burns will occur to hands and legs.

Horse vaulting

Pommels should be removed from the horse, and holes where the pommel shafts were inserted should be covered. The horse should be

Figure 2. Good technique will help make her a champion.

waist high for beginners and chest high for advanced gymnasts. At the far side there should be mats 20 feet by 5 feet by 4 inches; at the near side, there should be a Reu...r board or jump board, which should be moved back further as vaulters improve. The surface on the horse should not be slippery and chalk should be used on hands.

The vaulter should learn how to spring off the board and onto the horse. Then he should spring off and land in a relaxed manner with two spotters grasping his arms. Basic vaults can then be learned with spotting. When advanced vaults (e.g., head- or handspring) are performed, two spotters should stand near the board and lift the vaulter while two other spotters should be on the far side to lift him off gently.

Vaulting is suitable for both boys and girls. In competition, girls vault perpendicular to the horse; boys in secondary school vault lengthwise. Before boys in class vault lengthwise, they should tumble and work on the trampoline.

Rings

There should be two sets of rings: one at chin height for the average pupil, the other at a height so that the tallest student can brush his feet while doing body swings. He must be stopped before j nping off. Work should only be done on stationary rings. A gymnast should not get on high rings until he can do the same basic skills as on the horizontal and parallel bars. After basics, a gymnast can go to a support above the rings with help. Most boys and girls from first grade on can do all of the basic skills below the rings and probably a simple support above.

References

Babbitt, Diana H. and Haas, Werner. *Gymnastic Apparatus Exercises for Girls*. New York: The Ronald Press Co., 1964. 130 pp. (W)*

Bailey, James A. *Gymnastics in the Schools*. Boston: Allyn and Bacon, Inc., 1965. 297 pp. (M)**

Claus, Marshall. *A Teacher's Guide to Gymnastics*. Palo Alto, Calif.: The National Press, 1967. 162 pp. (M)

DeCarlo, Tom. *Handbook of Progressive Gymnastics*. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1963. 240 pp. (M)

Division of Girls and Women's Sports. *Gymnastics Guide*. Washington, D.C.: American Association for Health, Physical Education, and Recreation, 1969. (W)

Drury, Blanche J. and Schmid, Andrea Bodo. *Gymnastics for Women*. rev. ed. Palo Alto, Calif.: The National Press, 1965. 204 pp. (W)

Frederick, A. Bruce. *Women's Gymnastics*. Dubuque, Iowa: William C. Brown Co., 1966. 81 pp. (W)

Frey, Harold J. and Keeney, Charles J. *Elementary Gymnastic Apparatus Skills Illustrated*. New York: The Ronald Press Co., 1964. 144 pp. (M)

Griswold, Larry. *Trampoline Tumbling*. St. Louis: Business Collaborators, Inc., 1958. 120 p. (M-W)

* Women
** Men

Harris, Richard. *Safety and Rebound Tumbling.* Cedar Rapids, Iowa: Barnes Publishing Co., 1960. (M-W)

Keeney, Charles J. *Trampolining Illustrated.* New York: The Ronald Press Co., 1961. 160 pp. (M-W)

LaDue, Frank and Norman, James. *Two Seconds of Freedom.* Cedar Rapids, Iowa: Barnes Publishing Co., 1960. 167 pp. (M-W)

Loken, Newton C. *Complete Book of Gymnastics.* rev. ed. Englewood Cliffs, N.J.: Prentice-Hall, Inc. 1967. (M-W)

O'Quinn, Garland. *Gymnastics for Elementary School Children.* Dubuque, Iowa: William C. Brown Co., 1967. 122 pp. (M-W)

Ryser, Otto E. *A Teacher's Manual for Tumbling and Apparatus Stunts.* Dubuque, Iowa: William C. Brown Co., 1961. 193 pp. (M)

Sunby, Glenn, ed. *Mademoiselle Gymnast.* Santa Monica, Calif.: Sunby Publications. Current periodical. (W)

———. *Modern Gymnast.* Santa Monica, Calif.: Sunby Publications. Current periodical. (M-W)

Szypula, George. *Beginning Trampolining.* Belmont, Calif.: Wadsworth Publishing Co., 1968. (M-W)

———. *Tumbling and Balancing for All.* Dubuque, Iowa: William C. Brown Co., 1968. (M-W)

Consultant

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Marksmanship | STANLEY A. MATE, A.B.

26

Competitive shooting, shooting training, or shooting practice carried on in an organized group are among the safest of the sports. Studies conducted by Joseph G. Dzenowagis at Michigan State University show that there were no accidents for people participating in shooting and hunter safety in men's physical education activities from 1955 through 1960.[1] Other rates run from 1.3 per 1,000 participants for badminton to 26.0 for wrestling. The rate for leisure sports and group games was 6.4. Some elements which contribute to this condition of safety are trained, experienced leadership; the standard disciplines under which these activities take place; and proper range construction. For further information on firearm safety, see Hunting and Shooting Section, page 255.

Leadership

Trained instructors and coaches are essential to the teaching of marksmanship. A knowledge of the standard procedures which are used in conducting shooting and a knowledge of teaching sequences and techniques are required. Instructor training of this type is available through several agencies. The National Rifle Association of America (1600 Rhode Island Avenue, N.W., Washington, D.C. 20036) has listings of instructors and instructor trainers. Instructors are trained through the Outdoor Education Project of the American Association of Health, Physical Education, and Recreation. College and high school ROTC units may also be able to provide instructors or instructor training. In recent years, several universities have included shooting training and training for rifle instructors in the physical education curriculum.

Leadership for competitive shooting activities needs different skills. Referees and tournament officials need a sound background in shooting, including range procedures, and an intimate knowledge of the official rules and tournament operation. The National Rifle Association and athletic conferences and associations sanction shooting competitions. Information on such tournaments are available from the NRA. Schools and colleges frequently obtain this information from their own conference or association.

Disciplines and procedures

Shooting ranges should be operated with strict adherence to range commands and standard range procedures. The range commands, which are a part of the official shooting rules,

[1] Joseph G. Dzenowagis, *Safety Monographs for Colleges and Universities, No. 14 Injuries in Men's Physical Education and Intramural Sports* (Chicago: National Safety Council, 1962).

are the principal means by which the range officer or instructor maintains complete control of shooting activities. They should be used at the beginning of training and continuously through practice and competitive activities. Standardization enhances safety since the student or competitor deals with a pattern which he understands and can anticipate.

There are some regulations which apply to all ranges, although a special range may necessitate additional local regulations. Gun actions are open and the guns unloaded except when the shooter is actually on the firing line. Unloaded means that there are no cartridges or shells in the chamber of the gun and none in its magazine. If the magazine is removable it must be out of the gun. If the gun is a revolver, the cylinder must be swung out of the frame. Shooters on the firing line are subject to the command of the person serving as range officer. There is no firing except when the command "commence firing" is given. "Cease fire" must be obeyed immediately, even if the trigger is partially depressed. The action and the gun should be unloaded at once. No one goes forward of the firing line for any purpose without the express permission of the range officer. When this is allowed, it is only during a "cease fire" with all guns on the ground, floor, or bench and with the shooters standing well away from the guns. No one is allowed to touch or handle a gun, even an unloaded one, when another person is downrange. In many ranges it is never necessary for anyone to go forward of the firing line for any purpose except, perhaps, when targets must be changed manually.

Violation of range safety regulations and unwillingness to obey range commands or the direction of the instructor or range officer are ample reasons for dismissal from the range.

Range construction and equipment

Indoor rifle ranges involve the same safety considerations as any other room. Beyond that point, the problem of safety is almost entirely one of bullet containment. Bullet containment starts with a bullet stop or backstop. The most common type consists of a steel plate angled at 40 to 45 degrees. The bottom of the plate is away from the shooters. The plate extends the full width of the range and covers a vertical distance of about six feet. Usually the plate extends to the ceiling but, where that is not practical, bullet absorbing material can be placed above it to the ceiling. The bullets are deflected from the plate into a sandpit, 8 to 12 inches deep, built in front of the deflector.

Regular maintenance is required. The life of the plate is long but erosion eventually takes place. Pockmarks should be welded over and ground smooth. Unless special armor plate is used, firing should be restricted to .22 caliber ammunition. The sandpit should be raked periodically to remove accumulations of lead.

If the bullet stop does not cover an entire wall, and there are doors, windows, or other openings in the wall, they must be sealed permanently and covered with steel plate or some other material which the maximum ammunition allowed on the range cannot penetrate. Side windows and doors must be given the same treatment. Electrical fixtures, conduit, plumbing, and heating pipes must be protected from penetration by baffling. Ceilings and floors, unless they are concrete or of some other impenetrable construction, should be reinforced or baffled to prevent bullet penetration.

A definite firing line must be established. A stand should be provided which will enable the range officer or instructor to see all shooters. Rifle racks should be provided so that there is a specific and orderly place to put guns not in use.

Outdoor ranges have the same basic requirements. These ranges must either provide for bullet containment through an earth backstop, natural barrier, or suitable overhead baffles or must provide sufficient safety zones to make the baffles unnecessary.

Plans for all types of shooting ranges are available from the National Rifle Association.

References

American Association for Health, Physical Education, and Recreation. *Shooting and Hunting*. Washington, D.C.: The Association, 1960. 94 pp.

———. *The Air Rifle As An Instructional Tool*. Washington, D.C.: The Association, 1960. 22 pp.

National Rifle Association. *NRA Official Rule Books*. (Air gun, High power, Pistol, Shotgun, Smallbore rifle). Washington, D.C.: The Association. Annual publications.

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Track and Field | DON CASH SEATON, Ed.D.

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Track and field is one of the safest of the team sports. Despite the fact that over 600,000 high school trackmen and approximately 110,000 college men and women participate in track, there is only an occasional death and relatively few serious injuries each season. Most surveys of college accidents reveal that the sport ranks low among all sports activities. Three midwest states have found an average of only 4.3% of their claims paid for high school athletic benefit plans for track and field, while for football the average was 61.8%. On the other hand, Clark found in an eight-year study at a private prep school that track and field ranked third to football and soccer, with 580 injuries treated in his clinic.[1] Twenty of these were fractures, no dislocations or concussions, 30 lacerations, 174 abrasions, 91 sprains, 204 strains, and 61 contusions. Pechar found track and field to rank fifth (5.6%, football 38.5%) among 96 junior and senior high school sports accidents in New York State.[2] As noted, most of the injuries were of a minor nature.

In a study of junior high school sports accidents in 207 schools, Dissinger found track to rank sixth among 22 sports with the accident incidence being 44 compared to basketball's 219 and football's 142; the severity index was .60 for basketball, 1.14 for football, and 1.09 for track. More than 80% of the injuries in track and field occurred to the legs, feet, arms, and hands.[3]

Dangerous events

Field events (especially the throwing of the discus, hammer, and javelin) are by far the most dangerous sports, accounting for the few deaths that have occurred in recent years. The danger is usually not to the weight contestant but primarily to spectators and other contestants who enter the throwing area. Jumping events are always potentially hazardous to the contestants. Pole vaulting, the triple and long jumps, and high jumping *are always dangerous*, especially to the lower extremities of the body.

With the advent of fiberglass poles and the unheard of heights attained, pole vaulting has become quite hazardous, especially when the landing pit is not of sufficient height and proper

[1] Donald M. Clark, Some medical aspects of precollege sports for boys, in *Proceedings of the Sixth National Conference on the Medical Aspects of Sports* (Chicago: American Medical Association, Nov. 1964).

[2] Stanley F. Pechar, Accidents and prevention in secondary school physical education, in *Transactions, School and College Safety* (Chicago: National Safety Congress, 1962), p. 107.

[3] Jean Katharyn Dissenger, Accidents in junior high school physical education programs, *Research Quarterly* 37 (Dec. 1966), no. 4.

quality. With the introduction of the "Fosbury-Flop," high jumping may have an added dimension of danger.[4] Tom Ecker has this to say about safety in pole vaulting:

> The laws of physics involved in the bending and unbending of fiberglass poles dictate that the poles be manufactured with an emphasis on weakness — not strength. A pole that is too strong to be bent is useless. However, if a pole is weak enough to be bent, it can never be strong enough to be immune from breaking.
>
> Every fiberglass pole has a great range of P_e ratings, depending upon the height of the handholds, ranging from very high numbers at the low handholds to relatively low numbers for the highest handholds. It is obvious, then, that poles cannot be classified by the body weight of the vaulter with any accuracy without also allowing for his handhold height, take-off speed, etc. The many possible handhold heights, coupled with the difficulty of measuring the amount of kinetic energy at the time of pole plant, is why pole selection has become a rather unscientific, "by guess or by God" procedure.
>
> Some of the pole manufacturers classify poles by body weight alone, which is completely useless. Others provide formulae which definitely aid in pole selection, but even those do not allow for the vaulter's kinetic energy. Certainly, using both the vaulter's body weight and his handhold as a basis will at least establish a point from which to begin.[5]

Most coaches agree that one of the best methods for avoiding injury is to land with the body and not break the fall with the arms.

The track events hold relatively few dangers other than the much feared pulled muscle (or tendon). The pulled muscle is most prevalent among sprinters, hurdlers, and jumpers. It is often a catastrophic injury because the track man may be incapacitated for at least a month and often, in severe cases, for a season. Shin splints, although not an accident, are a persistent aggravation. Spiking may occur in relay exchanges and when jockeying for position in races not run in lanes. On rare occasions a hurdler or runner is injured (abrasions) when falling to the track.

Female competitors

Track and field has experienced a tremendous increase in popularity among female competitors during the past decade. The stimulus of international competition, especially the Olympic Games, and the gradual overcoming of the folklore which held that running, jumping, and throwing would be detrimental to a female's health, have been major factors in this growth. It is now accepted that such participation is no more harmful to female than to male competitors and each season finds them participating in the more difficult track and field events.

ADMINISTRATIVE CONTROLS

Competitive restrictions

The problem of restricting, for health reasons, the number of events and the length of the running events for competitors in track below the college level, and for females of all ages, has been a moot question. Many states have restricted high school competitors to one running event above the 220 yard dash and one competitor to three events. Most have limited the length of distance running to one mile on the track and to two miles cross-country. No states hold championship meets for junior high school students and relatively few sponsor meets for girls.

There appears to be little or no scientific support for any of these restrictions. Most physiologists, sports medicine experts, and reputable coaches believe that no harm can come to the

[4] Jumping style developed simultaneously and independently by Dick Fosbury of Oregon State University and by 15-year-old Debbie Brill of Langley, British Columbia.

[5] Tom Ecker, *Track and Field Mechanics* (Los Altos, Calif.: Tasnews Press, 1971).

hearts of youngsters or females through strenuous participation provided there is no disease and the training regime is well planned and carried out. In fact there is a general acceptance of the theory that only cardiovascular development through endurance exercise is the type of training that will lengthen life if adhered to throughout the life span.

The emergence of thousands of youngsters in swimming and track and their dominance in so many events would dispel most of our antiquated concepts of needed restrictions.

Meet controls

The greatest hazard in conducting a track meet is the desire of spectators, contestants, and coaches to get as close to the action as possible. Proper fencing and policing are necessary to keep them off the field; barriers (fences, hedges, ropes) must guard the landing areas of the weight events and the runways of the jumping events to prevent collisions with the competitors and to guard against persons being struck by implements. Similarly, the discus and hammer throw circles must be protected in the rear and on the sides by link-chain fences of sufficient design to protect the spectators and contestants from uncontrolled or misguided throws. The implements in all weight events should be carried back, not thrown back, to the contestants. Coaches would be wise to prohibit their weightmen from retrieving their own throws.

Rescheduling of the weight events and jumping events may be necessary if the weather condition and the field do not lend themselves to safe participation according to the rules.

The track events in meets present relatively few hazards to the contestants and none to the spectators. Good curve inspectors discourage fouls by the runners and an efficient clerk of course can avoid most of the hazards of conducting the races. Finish officials should not run onto the track to spot finishers; timers should remain on their ladders or in the stands as planned.

Relay runners finishing their "legs" of the race should remain in their lanes until the others are past. The inside and outside runners can step off the track to avoid contact.

Track-shoe dangers

Undoubtedly spiked track shoes are potentially dangerous. They are not only dangerous to the individual wearing them but to the runner's opponents in races not run in lanes and during relay baton exchanges. However, most competitors are aware of these dangers and are usually careful in these situations.

The controversial brush shoes (multi-spiked) may be so dangerous that the International Athletic Federation is considering barring their use. They believe that such shoes may cause undue strain in curve running and cause serious injuries during collisions.

Spiked shoes should not be worn for class instruction unless all members wear them.

Practice controls

There are several hazards to safety in track practice that need to be considered. One is the use of the starting gun. The modern pistols in which the powder explodes through the top or sides of the barrel are particularly dangerous when accidently shot while loading. If a hand or, more seriously, the eyes are close enough, the burn can be quite serious. Only coaches or trained managers should be permitted to use the starting gun. The gun should always be fired overhead.

The discus, hammer, and javelin should be used only under supervision; promiscuous use of these potential killers could lead to serious consequences, particularly when such implements are used for class instruction and for intramurals. These throwing areas should be marked and fenced for practice as well as for meets.

Runners should be aware of those actions or circumstances most likely to cause pulled muscles such as: cold weather, sudden spurts, hitting the curve too fast, passing the baton, practicing starts when not in shape, or lunging for the finish. When finishing against a mat indoors, the shock should be absorbed by the thigh and not the hands or feet.

Hurdles should have padded or hinged tops (or other safety types) to practice on. Some hurdlers need the interior ankle bone of the trail leg padded for protection when hitting the hurdle crossbar. Participants should always run fairly hard at the hurdle since slow clearance often results in injury. Fancy stepover displays also are dangerous.

High jumping restrictions

Following the sensational victory of Dick Fosbury (Oregon State University) in the high jump at the Olympic Games in Mexico, thousands of youngsters have been encouraged to imitate his unique style of crossing the bar on his back. The "Fosbury Flop," which requires the jumper to land on his back, shoulders, and head, is potentially dangerous. A joint comment by the National Federation of State High School Athletic Associations and the Committee on Medical Aspects of Sports of the American Medical Association states:

> The Fosbury method should not be attempted by an athlete nor encouraged by any coach until such time as the coaching techniques are fully understood by both the coach and the athlete. The second prerequisite to using this method must be a safe landing area. The school which cannot afford the inflatable air cushion or comparable landing area should not allow its athletes to attempt this method of jumping.

Figure 1. Proper instruction in the acceptable technique makes for a happy landing.

SAFETY PRECAUTIONS

1. All jumpers should use molded heel cups on the take-off foot.
2. Built-up pits are the safest for high jumping and pole vaulting.
3. The scissors high jump is hazardous and should never be permitted.
4. High jumpers must be taught to land and jump properly to avoid injury.
5. The "celestial" heights from which pole vaulters must descend call for a thorough study and adjustment of form by the vaulter and his coach if the vaulter is to survive injury.
6. Pole vaulters should use a pole of proper weight prescribed by the manufacturer.
7. Trackmen should thoroughly test the curves on short indoor tracks prior to their races.
8. Injured throwing arms often result when the javelin thrower does not lead with the elbow.
9. Hammer throwers must check the condition of the handle, wire, and swivel for safety's sake.
10. Pole vaulting events should be called off under extremely cold, windy, and rainy weather conditions.

References

Ecker, Tom. Fosbury flop. *Athletic Journal* 49:67-71, Apr. 1969.

———. *Track and Field Mechanics*. Los Altos, Calif.: Tasnews Press, 1971.

Florio, A. E. and Stafford, G. T. *Safety Education*. 3d ed. New York: McGraw-Hill Book Co., 1969. 459 pp.

Seaton, Don Cash; Stack, Herbert J.; and Loft, Bernard I. *Administration and Supervision of Safety Education*. New York: The Macmillan Co., 1969. 368 pp.

Stack, Herbert J. and Elkow, J. Duke. *Education for Safe Living*. 4th ed. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966. 374 pp.

Weight Training and Weight Lifting | RICHARD A. BERGER, Ph.D.

28

The attainment of strength is an important objective of physical fitness. It is achieved by a gradual increase of a load to a working muscle over a period of time, usually several weeks. After the exercised muscle adjusts to the initial load, more weight can be added. This method of gradually adding a weight load efficiently and in small dosages is referred to as weight training and weight lifting. The distinction between the two terms is based upon the desired objective. *Weight training* is performed to increase strength and general physical fitness and to improve physical appearance. *Weight lifting* is a competitive sport involving the three Olympic lifts referred to as press, snatch, and clean and jerk. The objective is to raise overhead as much weight as possible on a barbell in a prescribed manner. In both kinds of lifting the same precautions must be taken to assure safety.

Prevention of injuries

Several factors should be considered to assure safety while lifting.

1. Sufficient warm-up should be taken before lifting. Physiological changes in the muscles occur from activity performed with relatively light resistance. These changes prepare the muscular system for more strenuous activity. Consequently, it is expected that a warm-up will reduce the probability of muscular injury.
2. Training programs should be based on proved physiological and kinesiological principles to avoid over-training and injury. Competent teaching is necessary to gain optimal results and to eliminate possible deleterious effects from training. To avoid soreness, it is important that the muscles gradually adjust to the work load. The lifts should be performed correctly to prevent undue strain on the skeletal joints.
3. Several areas of 10 feet square each should be marked off in the gym for training, and only the lifter and spotters should be permitted in the areas. Congestion in the lifting area may result in injury to the lifter and other students if a barbell is unbalanced or dropped.
4. Whenever necessary, spotters should be employed to prevent injury while lifting. Lifts such as the overhead press or jerk, the bench press, and the deep knee bend should always be performed with a spotter on each side of the lifter. In fact, spotters should be used whenever any relatively heavy weight is balanced over the body. However, when training young children it is necessary to have one or two spotters for *every* lift.

5. Clamps on barbells and dumbbells should always be firmly secured. It frequently occurs in training that a barbell or dumbbell is not perfectly horizontal to the ground. Consequently, there is a tendency for the plates to slide off the bar and possibly injure the student and/or spotters. To prevent this, the clamps securing the plates on the bar should be tight.

Following these safety rules will allow the student to benefit from this wholesome activity without injury.

References

Hoffman, Robert. *Weight Training for Athletes*. York, Pa.: York Publishing Co., 1960.

Murray, J. and Karpovich, P. V. *Weight Training in Athletics*. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1956.

SAFETY IN DUAL SPORTS

Fencing | ROBERT KAPLAN, Ph.D.

29

Fencing has its origins in the frequently fatal and injurious art of dueling. Though the duel has long been outlawed throughout the world, misconceptions of fencing persist. Those unfamiliar with the sport envision the scenes recorded in history and depicted in motion pictures.

The modern sport attempts to retain the excitement and offer the challenge of dueling under conditions of maximum safety for the participants. Over the years, the rules and equipment regulations as well as teaching techniques have evolved to almost guarantee a high degree of safe participation. Recent formal studies of accidents and injuries in fencing do not exist.

One report of 1935 indicated that on the basis of 1.3 accidents per 1,000 exposures, college fencing was a "low hazard" sport.[1] On the basis of "days lost per 1,000 exposures," zero days were reported and fencing was classified as a "minimum hazard" sport. However, college fencing for women was classified as "hazardous" with 2.8 accidents per 1,000 exposures but still with zero days lost. Within the number of days lost, severity of accidents is not indicated. Though mortality statistics are nonexistent, fatalities are so rare as to be internationally newsworthy when they do occur. In the last 40 years, none has been reported in the United States. Internationally we hear of a fencing fatality about every 10 or 15 years.

The National Fencing Coaches Association of America has appointed a Safety Records Committee. Its objectives are to verify the safety of fencing with statistical evidence and recommend the promotion of even more effective safety precautions. Since this program is new, information is not yet available. The Amateur Fencing League of America (AFLA) constantly reviews international rules changes and revises its rules as often as necessary. The Division of Girls and Women's Sports of AAHPER follows the AFLA rules. The National Collegiate Athletic Association and the National Fencing Coaches Association adhere to the AFLA rules with minor modifications.

SAFETY RULES[2]

Most fencing rules are concerned with the prevention of injury: The weapons (foil, epee,

[1] F. S. Lloyd; G. Deaver; and F. R. Eastwood, *Safety in Athletics* (Philadelphia: W. B. Saunders Co., 1936), p. 26. See also Floyd R. Eastwood, Hazards to health, *New England Journal of Medicine* (Aug. 20, 1964), pp. 411-13.

[2] For a comprehensive review of the rules see Jose R. DeCapriles (ed.), *Fencing Rules and Manual* (New York: Amateur Fencers League of America, 1965).

and sabre) must conform to requirements for length, weight, flexibility, and thickness. Because the point is driven towards the target with considerable force, the flexing of a blade is necessary to absorb shock when a hit is made. Thus, though blades are manufactured straight, experienced fencers put a slight bend in them. This not only helps to prevent penetrating injuries but reduces bruising opponents and shattering blades. The rules prescribe the limits for the curve of the blade.

The points of weapons must be blunted to appropriate dimensions. The button or blunted end on the standard foil must be covered by a nonmetallic material. Fencers usually apply a thin strip of adhesive tape. This is meant only to "show the point" during combat so that if the tip breaks off, the missing end will be recognized immediately and the possibly lethal weapon will be replaced. Cushioning the tip with a ball of tape hasn't any value. Even the blunted tip will punch through and be exposed in a short while.

The point diameters of the electric foil, electric epee, and sabre are all carefully prescribed. They are designed to reduce the possibility of penetrating the mask or uniform without being unwieldy.

The mask is made of wire which must be rigid enough to prevent folding in on the wearer's face and to avoid penetration by the blade. Old, rusty masks are unsafe. Safe masks *must* be worn during competition.

Fencers must wear a uniform of material such as canvas duck with sufficient weight and weave to resist penetration by the blunted blade. Certain body areas, particularly the vulnerable underarm area, must have reinforced protection. In epee, the most rigid weapon, an additional undergarment must be worn. Women, who may

Figure 1. The body position of these fencers is often found in beginners and places undue strain on the knee joint. The jackets are adequate for class beginner instruction, but would not be suitable for competitive levels. Note lack of gloves on fencing hands.

fence only with foils, must wear breast protectors of metal or other stiff material.

All fencers must wear protective padded gloves on the fencing hand to prevent the blade from running up the sleeve and to avoid serious cuts and lacerations.

There are no specific rules regarding the weight and resistance to penetration of fencing uniforms, masks, and gloves, the resistance of weapons to breakage, or the quality of steel in the blade. Therefore, fencing equipment must be purchased from reputable manufacturers.

Officiating

The safe conduct of a bout depends upon the skill and sportsmanship of the fencers. However, in competitions, the official, namely the director, has the responsibility of interpreting and enforcing the rules. He may disqualify a fencer for unsafe and improper equipment. Further, he is responsible for invoking the rules and penalizing fencers who cause hazardous collisions or make brutal and unnecessary hits. An official cannot prescribe fencing technique. A competent fencing official will know the rules well and will not tolerate unsportsmanlike or unsafe fencing.

Prevention of accidents

The rules do not provide for the conduct of practice sessions and unsanctioned tournaments. Here appropriate professional leadership and common sense are necessary. When accidents occur they most frequently result from improper conduct, unsafe equipment, or both. A sweatshirt is inadequate protection even for a blunted blade. Failure to wear a mask, even for demonstration, is unforgiveable. The length of the blade makes it necessary to exercise precaution even while carrying it to and from the fencing room. The instructor must inform the fencers of safety practices and enforce them.

References

Amateur Fencers League of America. *Fencing Rules and Manual.* New York: The League, 1965. 287 pp.

Division for Girls and Women's Sports. *Bowling–Fencing–Golf Guide.* Washington, D.C.: American Association for Health, Physical Education, and Recreation, Published bi-ennially.

———. *Selected Fencing Articles.* Washington, D.C.: AAHPER, 1971.

Information Sources

Amateur Fencers League of America, 33 62nd St., West New York, N.J. 07093.

The Athletic Institute, Merchandise Mart, Rm. 805, Chicago, Ill. 60654

National Fencing Coaches Association of America, c/o Castello Fencing Equipment Company, 30 E. 10th St., New York, New York 10003

Badminton, Handball, Paddleball, Squash Racquets, and Tennis | DAVID O. MATTHEWS, Ed.D.

30

BADMINTON

When played well, badminton demands a great deal of speed, flexibility, endurance, and agility. These qualities rarely result in injuries.

Hazards

1. A player might run into his doubles partner.
2. A player might be hit by his partner's racquet.
3. If both players are close to the net, one might receive a slash from his opponent's racquet.
4. Eye glasses might be broken by a doubles partner.
5. Pulled tendons and inflamed elbow joint might result from play.
6. A player might run into net posts or other objects near the court, such as benches, walls, water fountains, or gym equipment.

Avoidance of hazards

1. Remove all obstacles near the courts.
2. Have the players warm up before playing.
3. Instruct the players on how to get out of the way of their partners.
4. Conduct a good conditioning program with emphasis on stretching muscles and joints.

HANDBALL

Handball is not considered to be a highly hazardous game. However, the smaller the courts, the higher the incidence of injuries.

Hazards

1. A returned ball striking a person can cause serious as well as slight injury, depending upon the part of the body struck. A ball hitting a fleshy part of the body usually causes a bruise. A hit to the face, especially to the temple or eye, can cause serious injury.
2. If, in the act of hitting the ball, the striker catches his arm on the body of an opponent or partner, severe damage can be done to the musculature of his shoulder joint.

3. Persons attempting to hit a ball close to a wall often jam their fingers. Bone breaks may also occur.
4. Players often run into a wall when trying to reach a ball, which can result in dislocations, contusions, or broken bones.
5. Overexertion, especially by older persons, may lead to heart attacks.

Avoidance of hazards

1. Remove all projections, such as door knobs, from the insides of the courts.
2. Keep the floors of the courts dusted and skid proof.
3. Have good lighting.
4. Stress conditioning as a safety measure.
5. Have the players turn their faces away from the back of the court to avoid being hit on the side or front of the head by a returned ball.
6. Do not deliberately hit an opponent with the ball to get a hinder.
7. Instruction in strategy and safety techniques is important.
8. A program of conditioning which includes distance running, sprints, quick starting and stopping, dodging, twisting, and stretching is necessary to prepare a person for play.
9. Persons should not play to the point of exhaustion, especially if they are unconditioned or over 40 years of age.
10. Padded gloves will help prevent bruises of the hands. The gloves should be worn at all times by persons who are just beginning a season or who have not played for a long period of time. Sometimes soaking the hands in hot water for about five minutes before play will help reduce hand bruises.
11. Interchange of gloves may result in the passing of fungi from one person to another.
12. Hinders should be called whenever there is a possibility of injuring a player or of self-injury.

SQUASH RACQUETS

Accidents in squash that result in injury seem to increase as the size of the courts and caliber of play decrease.

Hazards

1. Almost all injuries are due to the victim being hit by a racquet swung by his opponent.
2. More cuts and bruises come from the follow-through swing than the forward swing.
3. Lacerations and contusions about the face and head are common.

Avoidance of hazards[1]

1. Watch out for yourself and other players.
2. If in doubt, don't swing; ask for a let.
3. If possible, allow the ball to get low before you hit it so your racquet will be low.
4. Take a small, low backswing and follow through with a small "checked" low motion.
5. As soon as you have hit the ball, get out of the way at once.
6. Technique: if an open faced swing (racquet face tipped back a little) is used, a high follow-through is unnecessary, and you won't hurt people; if you hit someone, it will be on the leg, not on the face.
7. Good instruction is necessary.

[1] Suggestions by John M. Barnaby, squash and tennis coach, Harvard University, Cambridge, Mass.

Other suggestions on avoiding injuries

Conditioning. Poor physical conditioning seems to increase the potential for hazards. Exercise for increasing strength, endurance, and flexibility may be used in a conditioning program.

Middle distance runs and sprints should be added to the work needed to condition a squash player thoroughly.

Officiating. Officials are usually provided in championship or intercollegiate matches. The referee should be generous in allowing a let whenever there is a question of unnecessary interference by a player when his opponent is playing a point and when there is unnecessary crowding. The referee must also call a halt to play if a person is injured.

Facilities and equipment. When courts are constructed, the advice of experts should be sought to insure that the wall and floor surfaces are suitable and that enough foot candles of light are provided. Good ventilation is needed so that the players will receive plenty of cool air. No projections of any kind should exist within the court.

Coaching.[2] Most hazards can be removed by a sound program of instruction. In short, a squash coach or teacher must have had a great deal of experience as a player. The art of squash playing is too technical to be taught by anyone not well versed in the game. Instruction is extremely important for beginners, who must be made aware of the game's dangers.

Medical supervision. Medical supervision cannot be provided in all schools where squash is played, but a first aid station should be located close to the courts.

PADDLEBALL OR PADDLE RACQUETS[3]

Paddleball or paddle racquets is a very hazardous game because of the danger of being hit by a paddle or racquet; serious injuries to the face and head have happened in game play.

Hazards

1. A player might be hit by a paddle or racquet.
2. A player might run into the court walls.
3. Strained or torn muscles or cramps might result from play.
4. A player might suffer from overexertion.

Avoidance of hazards

1. A player must always be aware of the position of his partner or opponent.
2. The stroke follow-through should be short and toward the front wall.
3. A player must not hesitate to call a hinder when there is danger of hitting another player with a paddle.
4. There should be wrist thongs attached to all paddles or racquets and the thong *must* be secured around the wrist.
5. Players should watch the play off the back wall. Failure to do so may result in another person running into or hitting the player with the paddle.
6. A good conditioning program of running and exercises should minimize the incidence of pulled or torn muscles and cramps.
7. Care should be exercised to prevent oneself from running into a wall.

TENNIS

Tennis involves few accidents. The nature of the game classifies it as a noncontact sport.

Hazards

1. Most people think tennis requires little conditioning and so strained muscles, pulled tendons, cramps, and inflammation of the elbow joints are common types of injuries.

[2] Opinions of Ed Serues, coach of squash, Amherst College, Amherst, Mass.

[3] Andrew J. Kozar et al., *Beginning Paddleball* (Belmont, Calif.: Wadsworth Publishing Co., 1967).

2. Falls resulting in abrasions and contusions can occur if the playing surface is slippery.

AVOIDANCE OF HAZARDS

1. Conditioning programs are necessary.
2. Safe court surfaces should be provided.
3. Crowding at hitting boards should be avoided.
4. Instruction in hitting techniques and court strategy is necessary.

Figure 1. Good organization and planning are needed for safe instruction.

References

Kozar, Andrew J. et al. *Beginning Paddleball.* Belmont, Calif.: Wadsworth Publishing Co., 1967.

Consultants

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Judo | EICHI K. KOIWAI, M.D.

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In the United States over 440,000 people participate actively in judo. The growth of judo has been phenomenal not only in this country but throughout the world. In the Amateur Athletic Union of the United States judo ranks third, exceeded only by swimming and track and field. An increasing number of secondary schools and colleges have included judo in their physical education and extracurricular activities. The growth of judo has been limited only by the lack of qualified, trained instructors.

In contrast to jujitsu and other forms of unarmed defense, judo is competitive and regulated by rules. As a contact sport, it presents potential for injury. The medical committee of the United States Judo Federation made a survey of the major accidents and injuries that occurred in judo from 1956 to 1961.[1] Of the 103 cases reported, the possible causes for 89 were ascertained (Tables 1 and 2). In certain cases a combination of factors lead to the mishaps. Of the total injuries, two-thirds occurred during competition while the other third happened during teaching and free exercise (randori).

To analyze these statistics, one must be familiar with the rules of contest and the various techniques used in winning (throwing and mat techniques and submission holds such as choking and elbow locks).[2,3] Throwing techniques (nagewaza) can be divided into two types — from the standing position (tachiwaza) and from the lying position or sacrificing form (sautemiwaza). There are various mat techniques (katame-waza or ne-waza, osaekomi-waza) where the opponent is held down and controlled for 30 seconds, enabling the holder (tori) to win. Choking (shime-waza) and joint locks (kansetsu-waza) are allowed as submission holds.

Based upon these findings, Tables 1 and 2 indicate recommendations to decrease the number of injuries.

Qualified instructors

The instructor should be thoroughly familiar with the rules, the possible causes of injuries, and be prepared to apply first aid, especially in reviving those who have been "choked out." He should emphasize that knowing how to fall (ukemi) is more important than knowing how to throw. In fact, falling is the first line of defense.

[1] E. K. Koiwai, Major accidents and injuries in judo, *Arizona Medicine* 22 (Dec. 1965), pp. 957–62.

[2] T. Ishikawa and D. F. Draeger, *Judo Training Methods* (Rutland, Vt.: Charles E. Tuttle Co., Inc., 1962).

[3] S. Nakabayashi, Y. Uchida and G. Uchida, *Fundamentals of Judo* (New York: The Ronald Press Co., 1964).

In the beginning, the novice must learn to fall in all directions — forward, backward, and sideward.

In the United States all qualified instructors are certified and registered with the United States Judo Federation (USJF). Before a black belt instructor is hired, his credentials should be checked to avoid possible liability due to injuries. The instructor should emphasize the importance of:

I. Throwing Techniques (Nage-waza)
   A. It is the responsibility of the thrower (tori) to tuck the sleeve of the uke (the one who is thrown) just before he lands so he will not hit his head and will land on his shoulder and side in the proper manner.
   B. The thrower must not drive the uke into the mat; this will allow the uke to fall properly.
   C. The thrower must not fall on the uke.
   D. A throw should not be forced or completed when there is impending danger, such as when an opponent's foot is caught between the mats.
   E. Certain types of throws (e.g., a wrapping hip throw) should not be used against individuals who have small, frail body structures.

II. Falling Techniques (Ukemi)
   A. The uke must break the habit of extending the hand or arm to brace himself for the fall. The impact of the fall can cause fractures of the wrist, forearm, and dislocation of the elbow. The real danger is the additional force caused by the thrower (tori) falling on top of the uke.
   B. The uke must learn to tuck in his shoulder and head so that the impact of the fall is distributed to his back and side

TABLE 1

TYPES OF JUDO INJURIES

Type			Number of Injuries
Fractures			34
Upper extremities		20	
Lower extremities		10	
Maxilla		1	
Rib		1	
Vertebra		2	
Dislocations and Separations			43
Upper extremities		41	
Shoulder		23	
Elbow		13	
Sterno-clavicular		1	
Finger		2	
Lower extremities		2	
Major Sprains			10
Upper extremities		5	
Lower extremities		4	
Cervical		1	
Concussions			6
Severe Contusions			4
Muscles		3	
Scrotum		1	
Torn Cartilage			3
Knee		2	
Rib		1	
Miscellaneous			3
TOTAL			103

SOURCE: E. K. Koiwai, Major accidents and injuries in judo, Arizona Medicine 22 (Dec. 1965), no. 12, 957-62.

TABLE 2

THE CAUSES OF JUDO INJURIES

Improper Throwing Techniques			30
Driving the Uke into the mat		14	
Concussion	4		
Shoulder separations	7		
Miscellaneous	3		
Following Uke to the mat for osaekomi		3	
Falling on top of Uke		8	
Miscellaneous		5	
Improper Falling Techniques			23
Reaching out with arm		15	
Dislocation of the elbow	8		
Torn muscles of the elbow	1		
Fracture of wrist	1		
Fracture of forearm	3		
Fracture of clavicle	2		
Falling on the point of shoulder		4	
Holding on to tori		1	
Miscellaneous		3	
Improper Playing Surface			10
Aborted Throws			12
Caught in judogi		6	
Miscellaneous		6	
Recurrence of Old & Recent Injuries			7
Mat Techniques (Katame-waza)			4
Miscellaneous			3
TOTAL			89

SOURCE: E. K. Koiwai, Major accidents and injuries in judo, Arizona Medicine 22 (Dec. 1965), no. 12, 957-62.

rather than directly on the point of the shoulder.

C. The uke should release his hold on the tori when he is being thrown. This prevents the tori from falling on top of the uke.

D. The uke should fall properly whenever he is thrown. However, when a match is at stake, the uke often attempts to abort the throw by twisting and spinning in the air to avoid losing the match. Such maneuvers introduce injuries.

III. Choking Holds (Shime-waza)

A. In order for choking holds to be effective, the tori must first control the uke's body before applying pressure on the vulnerable area of the neck.

B. At no time is pressure to be applied across or on the face.

C. The tori must release a choke hold as soon as the uke becomes unconscious.

D. The hold should not be applied unless a higher rank judoist who knows the resuscitation method (katsu) is present.

IV. Elbow Locks (Kansetus-waza)

A. The elbow joint is the only joint allowed to be locked.

B. The tori must release the hold as soon as the uke signals or calls submission.

C. The uke should not be too stubborn to signal and concede the match.

D. The referee must stop the tori and signal victory before the force of the lock causes damage to the elbow joint.

V. Mat Techniques (Osaekomi-waza)

A. In mat techniques undue force, illegal maneuvers such as wrenching the neck, kicking, biting, hitting, and pressure on the face can lead to serious injuries and complications. Therefore, all these maneuvers must be prohibited.

VI. Competition Area

A. The competition area should be kept smooth, firm, clean, cool, and free from cracks or openings. If straw mats (tatamis) are used, they should be on a wooden floor or platform. If plastic mats of ensolite are used they should be covered with tight canvas. If gym mats are used, they should be fitted as closely as possible and covered by a tight canvas.

B. The competition area must be adequate: a minimum of 20 feet by 20 feet, but preferably at least 30 feet by 30 feet. The mat material outside of the contest area should not be less than three feet. If the competition area is elevated, safety measures must be taken.

C. Every referee, official, judge, and player should be aware of improper playing conditions, such as a separation of mats under a canvas cover or between the straw mats. These unsafe conditions are often not easily recognized by observers outside the competition area.

VII. Aborted Throws

A. The judogi (the costume worn by judoists) simulates the ordinary jacket and pants worn by most men and is used to prevent bruises and, most importantly, mat burns. However, they themselves may contribute toward injury. For example, hands or fingers may be entangled and caught in the judogi during a throw. In free exercise (randori), the tori should not complete his throw if he realizes the uke is caught in his own judogi. On the other hand, if the tori is caught in his own judogi, the uke should fall without resisting the throw.

B. In aborting the tori's throw, there are certain rules that prevent the uke from using such maneuvers as reaping the tori's leg from inside his legs while holding the tori from behind. Such a maneuver can cause serious knee and leg injuries.

Recurrent injuries

The danger of returning to active free exercise and competition too soon after injury is apparent. The safest measure is to follow a physician's advice. Regardless of how minor the injury may seem to the judoist, sometimes its complications may lead to permanent injury.

As a rule, if a player can perform the following feats without pain or discomfort, he is in condition to return to judo after injury: (1) ukemi (breakfall), (2) uchikomi (form fitting of the throws with an opponent without throwing), and (3) free exercise at an easy pace and with the opponent's full knowledge that the player has experienced recent injury. The decision to return to active competition also depends on the skill, experience, and age of the judoist, and advice of his physician, instructor, and coach.

All judoists should have a complete physical examination annually, especially those who engage in active competition. In every tournament a physician should be present.

In judo, all participants must know the rules, the legal and illegal maneuvers, and the holds and throws; the instructors, referees, and judges must make sure that the rules are strictly enforced. The large number of participants — young and old, male and female — indicate that judo is a safe, enjoyable sport when properly supervised.

References

Amateur Athletic Union. *Official AAU-JBBF Judo Handbook.* 3d ed. New York: The Union, 1966.

The Athletic Institute. *Sportscope* 12:4, no. 1, Jan. 31, 1967.

Ishikawa, T. and Draeger, D. F. *Judo Training Methods.* Rutland, Vt.: Charles E. Tuttle Co., Inc., 1962.

Ito, Kazuo. *This Is Judo.* Tokyo, Japan: Tokyo News Service, Ltd., 1965.

Kodokan. *Judo.* Osaka, Japan: Nunoi Shobo Co., 1961.

Koiwai, E. K. Major accidents and injuries in judo. *Arizona Medicine* 22: 957-62, no. 12, Dec. 1965.

Nakabayashi, S.; Uchida, Y.; and Uchida, G. *Fundamentals of Judo.* New York: The Ronald Press Co., 1964.

Norton, M. L.; Safrin, M.; and Cutler, P. Medical aspects of judo. *New York State Journal of Medicine* 67: 1750-52, no. 12, June 15, 1967.

Wrestling

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Participation in vigorous and competitive physical activity is not without some measured risk of injury. As would be expected for a combative sport, wrestling results in a higher incidence of injury than other milder forms of athletics. Some authors have classified wrestling as "highly hazardous" based on data from an early study in 1937 showing the sport ranked fifth in incidence of injuries among high school sports and third among college sports.[1] Several other studies have shown more recently an injury ratio of approximately 5% to 10% while one high school study showed an incidence of 33.65 per 100 participants.[2,3,4,5] A subsequent study on Oregon high school athletic injuries suggested that wrestling could conceivably challenge football as the sport with the highest injury rate if present trends continued.

Such data certainly support the contention that wrestling is not a comparatively safe sport. It must be realized, however, that data on athletic injury incidence are rather meager for all sports and especially for wrestling. Incidence ratios rarely consider exposures to injury-producing events relative to number of hours of participation, length of season, or the number of preventable injuries versus injuries occurring when all necessary safeguards were taken. Being a physical contact sport, wrestling will more likely have a higher injury ratio than more sedentary activities, even under ideal conditions, but data presently available on injury rates undoubtedly represent higher than average statistics and can be reduced substantially by even a modicum of safe practice utilization.

Wrestling for the past ten years has been consistently ranked as one of the fastest growing interscholastic sports in the United States. Presently the number of participants in wrestling is exceeded only by those of the four major sports, but the number of qualified coaches and officials has constantly been far below demands. According to one nationwide survey on professional preparation of coaches, only about one-fourth of the high school wrestling coaches ever earned a varsity wrestling letter while in

[1] Frank S. Lloyd; George G. Deaver; and Floyd R. Eastwood, *Safety in Athletics* (Philadelphia: W. B. Saunders Co., 1949), pp. 99-104.

[2] Ignatius J. Konrad, A study of wrestling injuries in high schools throughout seven Midwestern states (Master's thesis, Michigan State College, 1951).

[3] Joseph Patacsil, An analytical study of the incidence of injuries sustained in intercollegiate and interscholastic wrestling (Master's thesis, Purdue University, 1955).

[4] Claude C. Reeck, A national study of incidence of accidents in high school wrestling, *Research Quarterly* 10 (March 1939), pp. 72-73.

[5] Richard G. Brown, Nature and frequency of injuries occurring in Oregon high school interscholastic sports (Master's thesis, University of Oregon, 1951).

high school, and only about one-third lettered in wrestling while in college. In the six sports surveyed, only track surpassed wrestling in the number of coaches who did not have an undergraduate degree in physical education.[6] Some coaches have not had even a physical education course in the sport.[7] A further result of its fast growth has been the generally inadequate provision of suitable facilities and safety equipment. Faulty supervision, poor facilities, and lack of proper equipment have undoubtedly contributed to an injury ratio in wrestling which can be substantially reduced.

Figure 1. Proper spacing, supervision, and foam plastic mats aid in reducing accidents.

Another major problem concerning the health of participants in wrestling is extreme or crash weight reduction practices. The American Medical Association's Committee on the Medical Aspects of Sport and the National Federation of State High School Athletic Associations have jointly condemned excessive weight reduction as dangerous and unfair. Recent symposiums have considered this topic in some detail and an official policy statement has been formulated.[8,9] Any agency sponsoring competitive wrestling

[6] Mathew G. Maetozo, Jr., An analysis of the professional preparation of interscholastic athletic coaches in selected sports (D.P.E. diss., Springfield College, 1965).

[7] Edwin R. Elbel, Athletic injuries in Kansas high school, *Bulletin of Education* 5 (1950), pp. 1-23.

[8] American Medical Association, Interscholastic wrestling and weight control, in *Proceedings of the Eighth National Conference on the Medical Aspects of Sports* (Chicago: The Association, 1967), pp. 34-44.

[9] Weight control — A problem for wrestlers, *Journal of the American Medical Association* 199 (March 27, 1967), no. 12, p. 45.

programs must give careful attention to these deliberations.

Prevention of injuries

The following recommendations for preserving the health and safety of wrestling participants have been digested from a recent comprehensive survey of research in wrestling. Readers are referred to the AAHPER publications on wrestling for more information.[10,11]

1. All participants must be given a thorough physical examination at the start and end of the season and again before returning to training after injury or illness. A carefully administered and medically supervised policy on weight reduction practices should be formulated and jointly approved by physician, coach, athlete, parents, and administrative officials. Competent medical care must be available continuously and a policy formulated for management of any injury. A physician should be in attendance at all competitive bouts and practice sessions.

2. Qualified supervisory personnel must be sought — coaches, officials, medical counsel.

3. Adequate facilities must be provided. Each participant requires a space of approximately 50 square feet for practice. Well protected floor space as well as padding of all walls, posts, heaters, etc., to a height of at least 5 feet is recommended.

4. If modern foam plastic wrestling mats are not provided, canvas mats must be covered with an appropriate material to reduce the incidence of mat burns and impact contusions. Covers must be kept sanitary by daily disinfecting and cleaning. Injuries resulting from catching a limb in a torn or loose cover or from spaces between improperly secured mats can be reduced by use of a tightened plastic cover over fastened place mats.

5. Participants in wrestling should be supplied adequate protective equipment. Uniforms and equipment must be clean. Knee and elbow pads as well as ear protectors should be made available and used.

6. Proper training prior to vigorous participation is mandatory. Training includes not only physical conditioning but also a reasonable knowledge of techniques, rules, and safety practices. Injuries tend to decrease as participants gain experience.[12,13] Since approximately 50% of injuries in high school and college wrestling occur during work on the feet, particular attention should be given to the takedown phase of wrestling.

[10] Philip J. Rasch and Walter Kroll, Safe wrestling, *Journal of Health, Physical Education, Recreation* 36 (March 1965), pp. 32-33, 44, 51-52.

[11] American Association for Health, Physical Education, and Recreation, *What Research Tells the Coach about Wrestling* (Washington, D.C.: The Association, 1964).

[12] Konrad, *op. cit.*

[13] Patacsil, *op. cit.*

References

American Medical Association. Interscholastic wrestling and weight control. In *Proceedings of the Eighth National Conference on the Medical Aspects of Sports*, pp. 34-41. Chicago: The Association, 1967.

Lloyd, Frank S.; Deaver, George G.; and Eastwood, Floyd R. *Safety in Athletics*. Philadelphia: W. B. Saunders Co., 1949.

SAFETY IN AQUATIC ACTIVITIES

Elementary Swimming and Water Safety

SIDNEY C. HAZELTON, M.A.

Man is the only animal who has to learn to swim. Teaching a person to swim without simultaneously instructing him in the basic safety factors related to an aquatic environment is comparable to teaching a person to drive without teaching him respect for the rules of the road.

Knowledge and skill in themselves will not prevent all drownings, accidents, or illness in the water. Many times swimmers do not have sufficient knowledge of safe water conditions or of the skills to be used in an emergency. A person who does not go swimming is not necessarily protected from drowning. Many people drown simply because of falls into the water. Training in water safety is particularly essential for the protection of children.

The American National Red Cross since 1914 has conducted a water safety program with the primary purpose of reducing drownings by developing *skill* and *knowledge* that will contribute to safety *in, on, under* and *near* the water.

WATER SAFETY

In addition to the prevention of drownings, water safety is concerned with the total health and welfare of people in water settings. It deals with the causes, prevention, and elimination of conditions, practices, or procedures which are detrimental to the swimmer.

Knowledge necessary for safety in aquatics consists in large measure of knowing *when, where*, and *how much* to participate. Safety *skills* are made up of abilities to meet common hazardous conditions which the bather faces from time to time. This is the substance of personal safety in the water. Today, this knowledge and skill, commensurate with the age and abilities of the swimmers, are given as part of many swimming lessons.

A water safety program has as its primary objective the creation in every individual of an awareness of accident causes and the ways in which accidents can be prevented. Experience has shown that the most effective way to attain this objective is through certified courses taught by trained instructors. These include progressive courses in swimming from beginner through advanced swimming and cover lifesaving, survival swimming, boating, canoeing, sailing, and other water sports.

Swimming

Water safety begins with learning to swim and receiving instruction in aquatic skills and knowledge which will enable an individual to take care of himself in the water in emergency situations.

One must learn to respect the water not because it is a wonderful friend but a bitter enemy. An individual cannot use land habits and practices in the water and be safe. He must learn to play the game according to the rules which the water requires in order to be safe.

Swimming pool owners must keep their facilities safe and healthful by:

1. reducing hazards to a minimum.
2. controlling and regulating the actions and conduct of the patrons who may cause injuries to themselves or to others. Some things may be done safely in the water or on land, while others may not; these should be stated as rules and regulations.
3. protecting the safety, health, and welfare of patrons by enforcing the rules and regulations which have been established for the good of all.

Supervision

Adequate supervision of the facility must be maintained at all times. Lack of this supervision is one of the greatest causes of accidents and fatalities. Supervision is a state of mind. One must be alert to anticipate and observe dangerous situations and to prevent them from starting.

Drownings

Approximately 7,000 persons drowned in the United States in 1966, an increase of 200 over 1965. Of these, about 2,700 were swimming or playing in the water. The remaining 4,300 drownings were nonswimming fatalities: persons falling into the water from shores, docks, bridges; transport accidents involving ship repair, fishing, and recreational boating; plus accidents in the home and on home premises.

Total deaths from drowning accidents in 1965 were 6,799. There were about 906 deaths of children under 5 years of age; 1,391 from ages 5 to 14; 1,598 from ages 15 to 24; 648 from ages 25 to 54, 375 from ages 55 to 74; and 194 of persons 75 years and older. There were 15 deaths of people whose ages were unknown.

Home drowning accidents accounted for about 750 lives in 1966. Special studies reveal the locations as follows. swimming pools, 250; bathtubs, 200; wells, cisterns, and cesspools, 70; other open bodies of water, 100; other specified places, 60; unspecified places, 70.[1]

Bathing facility

In a reasonably safe bathing place, hazards are reduced to a minimum; provisions are made for the prevention of drownings, accidents, illnesses, and injuries; proper supervision and suitable equipment are provided for the detection and rescue of those who get into difficulty. A safe facility is just as necessary for nonswimmers as it is for advanced swimmers.

The swimming areas for the various skill or accomplishment classifications should be clearly marked. No swimmer, regardless of his classification, should be allowed outside of the area to which he is assigned until he has passed the required test.

Some basic requirements in developing a safe waterfront include pure, unpolluted, and tested water; a firm bottom with proper slope, free of slip-offs, holes, broken bottles, and cans; proper depths for teaching nonswimmers and lifesaving and diving skills; special considerations to tide, currents, undertows, and other water movement; consideration to waves which are dangerous to nonswimmers as well as to dock structures; and consideration to harmful varieties of marine life located in or adjacent to the swimming facility, such as jellyfish, Portugese man-of-war, and stingray.

[1] National Safety Council, *Accident Facts* (Chicago: The Association, 1967), pp. 14, 75, 84.

AQUATIC SUPERVISION

An efficient and effective aquatic instructor and supervisor must know definitely what his responsibilities are. They include inspection; maintenance; elimination of typical removable hazards in and around the facility and marking those which cannot be removed to make them conspicuous; keeping other staff members aware of their duties; and teaching survival techniques and knowledge as well as swimming skills.

He must enforce rules and regulations for health and safety, and see that these are conspicuously posted and understood by all participants. In supervised and well-regulated facilities, custom and knowledge of local conditions will dictate those regulations desirable to govern the conduct of bathers.[2]

Basic safety considerations to protect swimmers should include slow and gradual adjustment to water; restricted areas for swimming, diving, boating, canoeing, and sailing; regularly scheduled periods for aquatic activities; constant, alert, and competent supervision of aquatic facility or waterfront; ability tests to be sure that swimmers are placed in the proper classification; checking systems, both into and out of the water; availability of rescue equipment such as lifelines, booms, buoys, lifeboat, surfboard, heaving lines, shepherd's crook, grappling irons, and signals such as bells, whistles, or sirens to indicate local danger.

Swimmers themselves should understand health hazards, such as sunburn, sun stroke, and heat exhaustion (use dark glasses); immersion (be aware of deep-water signs); water in ears (use ear plugs and limit underwater swimming); sinusitis (use nose clip); and temporary discoloration and brittleness of hair (use bathing cap and hair oil).

Drowning

The basic causes of drownings include the lack of knowledge of water conditions and water hazards and the inability to determine what constitutes unsafe practices in and about the water.

Specific unsafe practices include diving before a previous diver has surfaced and moved out of the way; running on decks, runways, and ramps; pushing people into the water; swimming too soon following a heavy meal or when fatigued, cold, or hot. Other causes include the lack of swimming skill, lack of judgment or knowledge of rules, disregard of warnings, and trespassing when the facility is closed and not in use.

Some situations which result in drownings are: nonswimmers who get into deep water and are unable to regain their footing; novices who become exhausted and panicky; skilled swimmers who overestimate their ability or endurance; diving into shallow and unknown waters; cramps resulting from fatigue and chilling, such as the calves of the legs, stomach cramps contributed to by swimming too soon after a heavy meal, and other muscle cramps; heart attacks, epileptic seizures, and general collapse due to chill and exhaustion; attempting rescue without adequate lifesaving skill; and getting caught in weeds, currents, and undertows.[3]

Many recreational drowning accidents could be prevented if there were safe bathing places, constant and competent supervision, education and instruction of swimmers in knowledge and skills, regulation of bather activities through use of a check-in and check-out system and the "buddy system," and first aid and rescue equipment.

Accidents other than drowning

The major causes of minor and occasionally serious and permanently disabling injuries are falls and collisions with persons and objects, and contact with unseen or unnoticed hazards such as shells, sharp stones, roots, tin cans, broken glass, protruding nails, and splinters. Prevention

[2] American National Red Cross, *Life Saving and Water Safety* (Garden City, N.Y.: Doubleday and Co., 1966), pp. 14-15.

[3] *Aquatics Schools* (Washington, D.C.: American National Red Cross, 1949), pp. 60-63.

should be developed around a constant housekeeping program to eliminate hazards, control actions and activities of swimmers at all times on land and in the water, and to maintain alert and competent supervision.

Illnesses

Water contamination or pollution is the underlying cause of most illnesses such as diseases or infections caused by water borne bacteria, excessive vegetable matter, industrial wastes, and excessive sunlight. Personal causes or contributing factors include excessive immersion; chilling or fatigue; unwise aquatic stunts permitting water to enter sinuses of the head and the middle ear; neglect of water in the ears; improper or careless drying of the hair, the body, and the feet; and inadequate protection by clothing in cold weather after swimming.

Preventive action to provide water pure enough for swimming requires the maintenance of bather and spectator control, the initiation of filtration and disinfection procedures when necessary, and the removal of the sources of pollution. Illnesses caused by harmful practices among swimmers may be prevented by control of bather exposure to sunlight and to overimmersion; by prebathing warmups, slow and gradual, both physical and mental; and by the control of aquatic stunts.

Bathers should be instructed in health practices, such as never swim alone; have a preliminary physical examination; know your classification by ability tests; stay out of the water before group instruction; do not enter water when overtired, overheated, or cold; and leave the water if shivering or if lips or nails turn bluish in color, goose pimples form on skin, or if movement of limbs is difficult because of cold. Instruction also should include care of hair, skin, and feet, how to get water out of the ears, and prevention of sinusitis.[4]

SWIMMING AND WADING POOLS

Almost 500 pool fatalities were identified from newspaper accounts in a comprehensive Public Health Service study.[5] Highlights from this report follow.

Causes of death

The principal causes of pool fatalities, in order of frequency, were: falling or slipping into the water, 228; exhaustion, usually related to overestimation of ability and to lack of skill in water survival techniques, 85; not stated, 75; stepped or swept into deep water, 51; attack or illness, 20; struck an object, 15; support being used sank, slipped from grasp, or entrapped victim with head under water, 4.

Prevention

The most frequent contributing cause of pool fatalities appeared to be lack of or inadequacy of adult supervision of children and the victim's inability to swim.

Persons under 20 years of age represent 80% of the victims and the major target group for prevention programs. In the under 20 group, particular attention needs to be directed to children under 5. Among the various kinds of pools, those at residential facilities, particularly at homes, should be the major target.

No single action will prevent all pool fatalities or all injuries. Two measures — enforced by mandate if necessary — could prevent as many as half of the drownings. These are competent adult supervision while the pool is in use, and

[5] Daniel P. Webster, Pool drownings and their prevention, *Public Health Reports* 82 (July 1967), no. 7, pp. 587-600.

[4] American National Red Cross, *Life Saving and Water Safety*, pp. 62-63.

adequate enclosure to prevent or discourage trespass when it is not.

The number of deaths could be further reduced if a concerted effort was made to orient pool owners and users to accepted safety practices, to provide owners with the essential knowledge and skills for safe operation, and to instruct all persons, particularly youngsters, in water survival skills and emergency procedures.

Competent adult supervision is essential to prevent accidents. Leaving children temporarily unattended contributes to more drownings than any other single cause. It must be emphasized that children can never be left alone near water, *even for one minute.*

Provision for professional lifeguards should be mandatory at all pools other than those at private residences. However the mere presence of lifeguards will not provide adequate pool protection; for instance, 58 out of the 86 drownings in public pools in 1965 occurred while a lifeguard was present. Inattention, overcrowding, and murky water conditions were considered to be factors. Pool management must share with the lifeguards the responsibility for protection against drownings in crowded pools.

Properly designed and constructed barriers to help prevent trespass of the pool area, when the facility is not in use, represent the first line of defense against human error, such as breakdown in adult supervision. Such barriers may be supplemented by protective devices such as alarms and pool covers.

The pool bottom should slope gradually. A floatline should always be provided to serve as a lifeline and to keep weak swimmers in the shallow end. Depths should be marked on pool decks at each foot of depth change to show safe jumping and diving areas. The frequency of upper cervical neck fractures points up the necessity for this.

Widespread recognition and acceptance of safe practices in or near the pool would also materially assist in reducing pool accidents and fatalities. No person, regardless of athletic prowess, sex, age, or other condition, should

Figure 1. Mouth to mouth resuscitation must be performed with confidence. The victim's head must be tilted back with the chin up and the throat line straight. The rescuer should open her mouth wide, place her mouth over the victim's mouth, pinch the victim's nostrils shut, and blow hard at the rate of 12 breaths per minute.

bathe, swim, or work in or adjacent to the pool alone. Elderly people especially should be restrained from lone visits to the pool.

It should be a strict rule to swim before, never after, drinking, eating, and taking drugs or medication.

Hyperventilation has been identified as one of the possible causes of drowning. Hazardous contests involving hyperventilation and swimming underwater for distance or endurance have often claimed the lives of capable swimmers who appear to have drowned for no apparent reason.

Many other drownings would be avoided if people who are not competent swimmers would stay in shallow water. It would also help if everybody would avoid horseplay and would determine pool depths before jumping or diving.

Having the knowledge, experience, and essential equipment could prevent many accidents from turning into tragedies. Emergency instructions, protected against the weather, should be conspicuously mounted both within and outside the pool enclosure. Pool owners and users should be trained in artificial resuscitation, and instruction and practice in making elementary rescues and assists should be given to all personnel, owners, and users.

Children should be taught water survival techniques and skills at as early an age as their physical and emotional maturity will permit, but they must simultaneously be made to understand their own limitations in respect to water. Children of school age should be enrolled in organized learn-to-swim programs offered in the community.

SEASHORE

The causes of many drownings and fatalities, and their prevention at the seashore, are similar in most respects to those at ponds, lakes, and other open water areas.

Accident causation

One authority on ocean beach safety lists the following factors as contributing to seashore accidents.[6]

1. Poor supervision of children and lack of indoctrination of family members about the "buddy system." The guard seldom sees the person or persons in trouble; usually someone else reports the trouble.

2. Ball playing or rough play. Broken limbs, concussions, fractured skulls, sprained ankles, bruises can result from collisions or from fights.

3. Failure to observe danger signals warning bathers and swimmers to keep out of a roped-off area.

4. Danger of being struck by a sailboat, motor craft, or a surfboard when such equipment is being used in proximity to either swimmers or bathers. (Swimming in unenclosed areas also presents the danger of being carried, in a current parallel to shore, down below the point of entry.)

5. Use of spare tire tubes for floats.

6. Danger of collision with debris.

7. Judging ability to swim as great a distance at the beginning of a season as at the end of the preceding season. Muscle tonus is soon lost in cold water. When water is very cold, only very short periods of immersion are possible for beginners at any time. They do not move enough and are up and down so much that the evaporative process of drying in the wind absorbs much body heat.

8. Swimming out to rest on buoy markers which are thought to be of sufficient buoyancy to keep a tired swimmer up until recuperated from fatigue.

9. Attempted rescue in surf without equipment and previous training.

[6] Alexander Houston, *Possible Dangers at Ocean Beaches* (Boston: American National Red Cross, 1947).

10. Diving from moving bases which leave little stability, and which can cause disastrous neck injuries and other impairments.

11. Overexposure resulting in sunburn, heat stroke, heat exhaustion, heat cramps. There also is a strong possibility of nausea or cramps from a sudden complete immersion following violent perspiring from land activity.

12. Serious eye injuries from face mask broken by sudden diving or falling face forward into water; suffocation from having face mask drop down over mouth; and strangling from snorkel tube water when tube has not been blown clear of water.

13. Scuba casualties from running out of air at deep water depth so that surface cannot be reached in time to get more air, panicking from loss of mouthpiece, failure to clear mask flooded with water. Also, fatal embolism from holding breath and coming to surface with a rush, failure to make a fast release of weights in an emergency, and failure of diaphragm in regulator.

14. Danger from spinal meningitis and other fatal diseases in polluted waters.

Accident prevention

The better one knows a given seaside beach, the better he will be able to keep out of trouble. Being aware of what might cause accidents, doing everything possible to avoid them, and removing or avoiding the causes will prevent accidents from happening.

The following points are presented in relation to conducting swimming classes at the seashore.

Swim with the waves and not in heavy surf. Watch out for undertow and keep on top of the water. Schedule swim periods at high tides; one can swim two or three hours on either side of the high tide.

Avoid teaching back float to beginners when waves are present. The most effective strokes when swimming in rough water are the breast-stroke and the side-stroke. One will not find ideal conditions every time he takes his unit down to the beach. The instructors have to consider the weather, and make adjustments in their program. Dry land instruction may be given if weather is adverse.

Depths of water can range widely regardless of whether the tide is coming in or going out (move classes in as the tide comes in, and move them out as the tide goes out). Morning tides are colder than afternoon tides. Adjust the length of the "helping period" or instruction according to the temperature of the water. Recognize the fact that persons with more adipose tissue can tolerate cold water longer than the thin persons.

Accident prevention particularly requires good supervision. If water levels are affected by tides, it may not be feasible to erect lifelines. Good area restrictions can be maintained by the supervision of the counselor staff members, who should be qualified swimmers under leadership of a water safety instructor, each assigned to a small group of pupils. Properly placed two-man lifeboats, as well as surfboards, provide safety surveillance and immediate supervision for deep water activities.

ACCIDENT PREVENTION IN SWIMMING INSTRUCTION

How can integration of the prevention of accidents and the control of injuries be accomplished in the teaching of elementary swimming? Age of the pupils in a class must be considered. It seems to be the custom to associate nonswimmers with children, whereas there are adults who are also nonswimmers. The age of the pupils in the nonswimmer group is the cue as to the method of approach, the order in which skills will be presented, and whether or not the appeal should be made to a childish mind or a mature mind.

To teach beginner swimming to a 6-year-old is quite different from teaching it to a 12-year-old, a 16-year-old, or an adult. The skills are the same for all, but the teaching method and the order of presenting the skills are different. Teaching techniques must be adapted to the physical and mental abilities of the student.

Water survival training should be as much a part of the elementary school curriculum as driver education is for the high school curriculum. To teach a youngster to swim without an appreciation for some of the basic safety factors related to an aquatic environment is comparable to teaching a person to drive without respect for the rules of the road.[7]

Teaching guidelines

There are several general methods of presenting accident prevention information and skills to a class in elementary swimming.

1. Work in a safe and healthful bathing area. The children become accustomed to the high standards of a safe area and will recognize an area that does not employ the commonly accepted criteria of safety.

2. Discuss and demonstrate accident prevention skills.

3. Use visual aids, such as pictures, posters, texts, newspapers, and films.

4. Let the pupils practice under supervision and with correction.

[7] National Safety Council, *Operation Waterproof 4th Grade* (Chicago: The Council, 1967), pp. 3-4.

5. Include safety instruction in the rules and regulations of the facility. (The instructor can present to the class the good and bad features of the facility. In this way it is hoped that the pupils will learn to distinguish between the good and bad features of a waterfront. It will help them to learn safe water conditions.)

6. Call to the attention of the class any bathers who behave improperly in the water.

7. Whenever the occasion arises, point out to the class the safe limits of their area. Remind them that this information is posted.

8. Caution the class about any inherent dangers that may be involved in presenting a given skill.

9. Permit the use of flotation devices to overcome certain coordination problems. (Those who bring flotation devices to the area, however, should remain within the nonswimmer area when using them.)

10. Give ability tests to newcomers.

11. Remember that we are trying "to create in every individual an awareness of the causes of accidents, how they can be *prevented* and a *desire* to be safe."[8]

12. Everyone needs to know certain things about being safe in the water. That is what is meant when it is stated that one cannot take land habits into the water and be safe; he has to learn the "rules of the water."

[8] American National Red Cross, *Life Saving and Water Safety*, pp. 3-4.

References

American National Red Cross. *Life Saving and Water Safety*. 19th ed. Garden City, N.Y.: Doubleday and Co., 1966. 248 pp.

———. *Swimming and Water Safety*. Washington, D.C.: American National Red Cross, 1968. 142 pp.

Bearse, Richard H. and Hazelton, Sidney C. *A Camp Aquatic Program*. 5th ed. Hanover, N.H.: Roger Burt Printing, Inc., 1966.

Hazelton, Sidney C. *A Method of Teaching Swimming to Young Children*. 4th ed. Hanover, N.H.: Roger Burt Printing, Inc., 1965.

——— and Pulis, Clifford A. *Diving Manual for Instructors.* 5th ed. Hanover, N.H.: Roger Burt Printing, Inc., 1966.

National Safety Council. *Accident Facts.* Chicago: The Council. Annual.

———. *Operation Waterproof 4th Grade.* Chicago: The Council, 1967. 14 pp.

———. Swimming. In *Safety Education Data Sheet No. 27.* rev. ed. Chicago: The Council, 1964.

Webster, Daniel P. Pool drownings and their prevention. *Public Health Report* 82:587-600, no. 7, July 1967.

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Recreational Swimming | M. ROGER WARREN, Re.D.

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Millions of Americans flock to public swimming pools and public beaches each year. The Bureau of Outdoor Recreation has predicted that by 1980 swimming will be the most popular outdoor recreation activity in America. During 1965 nearly 68 million Americans, representing 48% of the population 12 years of age and older, went swimming.[1] Swimming ranks second in popularity of outdoor recreation activities behind walking for pleasure.

The growth of the swimming pool industry is another indication of the increasing popularity of swimming. According to the Swimming Pool Industry 1969 Market Report, there were 10,800 swimming pools in the United States in 1948. By 1968 the total had grown to 891,900 permanent swimming pools, an increase of nearly 88,000 over the previous year.[2] The greatest growth has come in the construction of residential pools.

Drownings

Despite the tremendous growth in swimming activity, a survey of drowning accidents during the past 15 years shows a relatively constant figure. This is a great tribute to the many agencies which have done an outstanding job in promoting water safety. While this record is commendable, drowning continues to pose a formidable threat to the swimmer. Approximately one half of the deaths which occur each year by drowning could easily be prevented. Drownings in swimming areas are largely the result of inadequate supervision, lack of swimming ability, and other causes which can be remedied.

Reducing swimming accidents

While it is desirable to reduce swimming accidents to a minimum, this should not be done at the risk of reducing participation in swimming. Most people swim because it is fun; some swim to improve or maintain physical fitness. When the methods used to reduce and prevent accidents take the enjoyment out of swimming, one of the major purposes of swimming has been eliminated. It is the purpose of this section to suggest some practices which will make the organized swimming pool, public beach, summer camp waterfront, and undeveloped water areas safer for the swimmer, but at the same time preserve the intrinsic value of the activity.

[1] Bureau of Outdoor Recreation, *Outdoor Recreation Trends* (Washington, D.C.: United States Department of Interior, 1967), p. 22.

[2] *Swimming Pool Industry 1969 Market Report* (Fort Lauderdale, Fla.: Hoffman Publications, Inc., 1969), p. 4.

THE ORGANIZED SWIMMING POOL

The terms *public swimming pool* and *organized swimming pool* are intended to be synonymous in this section. Both refer to swimming pools operated by organized groups. The intent of this section is to deal with all types of swimming pools *except* private residence pools.

Many safety hazards which plague the swimming pool administrator can be eliminated by providing a well designed and constructed swimming facility. The cost of correcting an error made in the design or construction of a swimming pool is often exorbitant. Therefore pool plans must be checked and rechecked to eliminate safety hazards before construction is begun. The life which is saved or the disabling accident that is avoided is just as real a saving at this stage of development as a lifeguard rescuing a drowning victim.

An important initial safety consideration in designing a public swimming pool is to provide adequate parking and safe pedestrian access to the pool. The potential automotive and pedestrian traffic to be generated by the pool should be carefully considered and adequate allowances made for safety of patrons coming to and from the pool. The pool should be so designed that emergency vehicles have convenient access to the pool enclosure and filter area.

The entire area of an outdoor pool should be protected by a wall, fence, or planting barrier at least six feet high.

Safety considerations should not be overlooked in the swimming pool bathhouse or locker room. The deck of the pool and floor of the bathhouse or locker room should be on the same elevation. Steps should not be permitted between the pool deck and locker room. Floors and decks should be relatively smooth, but with a nonskid texture to minimize slipping. To ensure complete draining (wet spots are slippery), the pool deck and bathhouse floor should be sloped not less than one-fourth inch per foot toward the nearest drain. The swimmers' entrance from the bathhouse to the pool deck should be at the shallow end of the pool.

A well equipped first aid room should be provided in the bathhouse. This room should be used for first aid purposes only and not as a combination first aid room and lifeguard dressing room or storage room.

Depth of water should be clearly marked on the edge of the deck and above the water level on the vertical walls of the pool. These markers should indicate minimum and maximum depths and every foot of depth change and should be spaced at no more than 25 foot intervals. Water depth markers should be on both sides and ends of the pool, and it is particularly important to have them at the break points between deep and shallow water. Depth markers should be in numerals at least four inches high and of a color contrasting with the background.

The slope of the floor of the shallow area should be uniform and not greater than 1 foot vertical in 12 feet horizontal. The slope of the floor between the transition point and the deepest part of the pool should not be greater than 1 foot vertical in 3 feet horizontol. Floors in shallow water areas should have slip-resistant surfacing.

A safety line should be provided about one foot before the break in grade between the shallow and deep portions of the swimming pool. This is usually placed at about the five foot depth to separate the shallow area from the diving area. The safety line should consist of a one-half inch minimum diameter line with colored floats at no greater than five foot spacing. The terminals of the line should be securely anchored and have no projections which might be hazardous to swimmers.

An improperly designed diving tank can create a hopeless hazard in a swimming pool. The total width of the diving area should be 32 feet for a one-meter board and 35 feet for a three-meter board. The deepest point in a pool should be approximately 5 feet from the end of the diving board and should have a depth of 10 feet for a one-meter board and 12 feet for a three-meter board. Care must be taken to protect the diver who executes a poor dive and enters the water far from the end of the diving board. If the slope of the diving tank rises too sharply, the diver may be diving into water only six or seven feet deep. The diver who enters the water directly under the end of the diving board also should be considered. Problems of the poor diver can be eliminated by designing the diving tank sufficiently deep with a wide base or a gradual slope upward from the deepest point.

Clearance between diving boards and between diving boards and sides of the pool is a vital safety consideration. The distance between one-meter diving boards should be 10 feet and 15 foot lateral clearance should be provided for a three-meter board. A lateral clearance of 12 to 15 feet should be allowed between the diving board and the side of the pool.

All three-meter diving boards should have rails on both sides of the board. These rails should extend from the back of the diving board, forward to the edge of the pool. A double rail is preferred to protect a diver who slips and who might fall between the diving board and top rail.

Overhead clearance in an indoor swimming pool is an important safety consideration. A minimum of 15 feet of unobstructed head room should be provided above diving boards.

Diving boards should be completely covered with nonskid material. This material will wear off and boards should be checked periodically and resurfaced *before* they become dangerous. Treads on ladders to diving boards should be at least three inches wide over the stepping surface and of nonskid design.

Underwater lights add to the safety of a public pool by providing additional illumination for night swimming. Each underwater light should be individually grounded by means of the screwed or bolted connection to the junction box from which the branch circuit to the individual light takes off. The light should be flush with the pool wall so that a swimmer cannot catch a hand or foot in the fixture. Underwater lights utilizing more than 12 volts should be double grounded or equipped with an approved safety device for current leak detection and circuit inactivation.

There should be no overhead electrical wiring within the pool enclosure nor in such places where a broken wire could fall within the pool enclosure. Electric outlets on the pool deck should be located at least 10 feet from the edge of the pool.

Wading pools for small children should be separated from but adjacent to the shallow end of the pool. A barrier should be provided to prevent small children from wandering into the main swimming pool. This is often accomplished by providing a three-foot or higher fence around the wading pool. Benches, dense low growing plantings, and other methods can also be used to accomplish the purpose of restricting egress from the wading pool area.

Many authorities feel that a slide has no place in a swimming pool. When a slide is evaluated from a safety standpoint alone, it is hard to challenge this position. The author recognizes the inherent dangers of a pool slide but still believes that the enjoyment derived from a slide can outweigh the dangers under proper conditions. The danger of a slide can be minimized if kept in good repair and closely supervised. It is often necessary to assign one lifeguard to the slide during periods of heavy pool use.

A public swimming pool should provide one elevated lifeguard chair or platform for every 2,000 square feet of pool surface area. When more than one chair is provided, they should be on opposite sides of the pool. The chair should be located so that the lifeguard's necessary field of vision does not exceed an angle of 180 degrees.

Sun glare should be considered when locating lifeguard chairs and when considering the orientation of the pool. It is virtually impossible to eliminate completely sun glare. Umbrellas over the lifeguard's chair and sunglasses will help reduce glare; however, during some periods of the day the lifeguard may need to move to an alternate position to avoid glare.

Swimming pool sanitation

One of the primary objectives of the public pool administrator should be to provide clear, bacteriologically safe water for his patrons. Although some of the major considerations concerning safe sanitary practices in swimming pools will be mentioned, this area is much too complex to allow a complete discussion. The swimming pool operator should be completely familiar with pool sanitation methods. There are many good sources for this information; several are listed in the bibliography at the end of this chapter. One of the best is C. C. Stott's manual, *Swimming Pool Management.*

Minimum swimming pool sanitation requirements vary according to local and state public health regulations. Swimming pool operators should be thoroughly familiar with local and state laws governing sanitation for their pool.

Clear, clean water is achieved by an adequate filtration system. The optimum turnover period required to recirculate the volume of water in a swimming pool through the filtration system and back to the pool should be six hours. The filtration system should be operated and maintained so as to keep the pool water clear and clean at all times. The filter system should be operated 24 hours a day whenever the pool is in use. Under no circumstances should a pool be used when a six inch black disc on a white field is not clearly visible in the deepest part of the pool. This is a minimum standard for water clarity in a swimming pool.

Swimming pools should be continuously disinfected by a chemical which imparts an easily measured, freely available residual effect. Although bromine and iodine are gaining wider use as disinfectants, chlorine is still the most prevalent and in many states the only disinfectant accepted by health departments. When chlorine is used, a free chlorine residual of 0.6-1.0 ppm should be maintained throughout the pool whenever it is open or in use. A testing kit for measuring the concentration of disinfectant, accurate within 0.1 ppm, should be provided at each pool. Pool water should be maintained in an alkaline condition as indicated by a pH between 7.2 and 7.6. A pH testing kit accurate to nearest 0.2 pH unit should be provided at each pool.

Water testing should be performed and permanently recorded as frequently as necessary to maintain adequate chemical readings. In normal swimming pool operation the interval between tests should not exceed two hours.

Many pool chemicals are dangerous and manufacturer's recommendations should be carefully followed. Where gas chlorine is used the gas cylinders and gas-feeding equipment should be housed in a corrosion resistant and mechanically well ventilated enclosure with proper illumination. There should be an airtight duct from the bottom of the enclosure to the outside and a motor driven exhaust fan capable of producing at least one air change per minute. Electric switches for the control of artificial lighting and ventilation should be placed outside the enclosure. As an added precaution a gas mask should be stored outside but convenient to the enclosure.

Where granular chlorine is used, personnel must be warned not to pour water into a container of granular chlorine. An explosion can result and a number of severe accidents has resulted from this improper use of granular chlorine.

Floating materials should not be allowed to accumulate on the surface of a pool. Skimmers and water level controls should be used to continuously remove such material. The bottom sides, decks, and other surfaces should be kept free from dirt, slime, and algae to prevent slipping. Super chlorination as an algae control and frequent brushing and vacuuming will generally prevent these problems from occurring.

Pool administration

Good management is an essential ingredient in the safe operation of a swimming pool. The pool operator's concern for safety is evidenced by the policies he establishes with regard to his staff and the people who use his pool facility.

Prior to the opening of a new swimming pool, limits for swimming loads for the pool should be established and enforced when the pool is in operation. An overcrowded pool is both unsafe and uncomfortable for the swimmer. There are a number of suggested standards for determining swimming loads, and in some states swimmer loads are controlled by state health department swimming pool regulations.

The National Swimming Pool Institute suggests a load limit of one person per 20 square feet of pool and deck area combined. The Los Angeles Department of Recreation and Parks allows 15 square feet per swimmer in shallow water and 30 square feet per swimmer in deep water. Shallow water is usually defined as being five feet deep or less. The Detroit formula is a good one; it provides for seven persons per 100 square feet of shallow water, four persons per 100 square feet of deep water, and one person per 100 square feet of usable deck area (estimated that 30% to 40% of swimmers will be on the deck).

An equal important safety consideration is the relation between swimmer load and lifeguards. A good safety practice is to require that a minimum of two lifeguards be on duty any time a pool is in use. Here, too, standards vary, but a generally accepted practice is to provide one lifeguard for each 100 to 125 swimmers.

A vital administrative consideration is regulations established to maintain safe conduct in the pool area. Although pool administrators would have difficulty in agreeing on a single list of desirable safety regulations for a swimming pool, the following list should provide guidelines. This list deals only with regulations which directly or indirectly involve the safety of the pool patron. Other regulations would need to be established regarding the smooth operation of a swimming pool facility.

1. Running should be barred in pool area.
2. Patrons should be asked not to talk with lifeguards on duty.
3. Glass containers should be barred from the pool area.
4. People with open wounds, sores, and skin infections should be forbidden to enter the pool.
5. No swimming should be allowed during electrical storms.
6. Alcoholic beverages or persons under the influence of alcohol should be excluded from the pool area.
7. Rules and regulations concerning the use of flotation devices should be considered.
8. Only one person at a time should be allowed on a diving board and the steps leading to the board.
9. Double bouncing on diving boards should be prohibited.
10. Divers should be instructed to wait until the preceeding diver has surfaced and cleared the area before diving.
11. Diving should not be allowed from the side of the board.
12. Depending on the design of the area, diving from the side of the pool should be prohibited in the diving area.
13. Pools with slides should consider regulations against coming down backwards, feet first on the stomach, on feet or knees, playing under the end of the slide, and attempting to walk or crawl up the slide.
14. Regulations should be considered concerning the use of breathing devices — snorkles and scuba equipment. Most public pools forbid the use of such equipment during normal operating hours.

It is a good idea to have a general regulation such as, "Conduct which jeopardizes the safety and comfort of others will not be permitted." This gives the pool staff the flexibility of judgment to stop any action by a patron which may be dangerous.

It is extremely important for the pool staff members who are responsible for enforcing regulations to understand the reason behind each regulation. Rules and regulations should be conspicuously posted at appropriate locations.

Good swimming pool management implies good maintenance practices. Many of the safety practices already discussed fall within the realm of good daily maintenance of the pool areas. All parts of the pool should be kept in good repair. Buildings, filter room, and pool equipment should be routinely checked for safety hazards; this is best accomplished by maintaining a permanent safety checklist. This does not imply that the checklist *is* the safety program at a pool. The pool staff should be constantly alert to hazardous conditions and see that they are remedied immediately. The checklist serves merely as a reminder for items which may have been forgotten.

Another important administrative consideration is providing adequate safety equipment. Most state swimming pool codes require that one unit of lifesaving equipment be provided for each lifeguard chair or station. A unit is defined as being either a ring buoy with rope attached, a 12 to 16 foot reaching pole, or a throwing line. Many experts believe that the reaching pole is by far the most practical piece of rescue equipment for a swimming pool; most pool rescues occur within the range of a reaching pole. A lightweight aluminum pole with padded end is recommended, and one pole should be attached to each lifeguard chair.

When the pool is lighted for night use emergency lighting should be provided. Probably the simplest solution is to provide a battery powered light at each lifeguard chair during the hours the pool is in operation at night.

An intercommunication system between lifeguard chairs which is connected to the pool director's office can be a valuable safety tool. A lifeguard will occasionally observe an unsafe practice near another lifeguard's position. He can quickly and easily call the guard's attention to the matter without leaving his position or resorting to whistle blowing which should be reserved for really dangerous situations. The pool director has immediate communication with a lifeguard or with all guards at once. The guards may also communicate with the pool director and seek help with a discipline problem which otherwise might require them to leave their stations. The first aid room should be equipped with all supplies necessary to help those needing medical attention. Resuscitation equipment, either manual or mechanical, is valuable if properly maintained. When resuscitation equipment is available, it is imperative that the entire pool staff be properly instructed concerning its use. The first aid room should be equipped with a cot, stretcher, and blankets.

Swimming pool staff

If there is a single key to swimming pool safety it is the staff which is responsible for the pool's operation. Each agency which operates a swimming pool should establish personnel standards for each staff position and adhere strictly to these standards. Qualified personnel will not necessarily assure a safe pool operation, but it is certainly a step in the right direction. A complete job description should be sent to a staff member when he is offered a position. This procedure can prevent misunderstandings which may lead to negative attitudes on the part of the staff member. There is a tremendous advantage in requiring lifesaving skills for all pool employees, not just lifeguards. If locker room attendants and cashiers are qualified and trained in lifesaving skills, they can be used in emergency situations.

Once qualified staff has been secured, a staff training program is essential. If pool manuals are sent to staff members before formal training begins, they can familiarize themselves with policies, procedures, and regulations for both the staff and public. The pool manual and policies should constantly be reviewed, evaluated, and modified when indicated.

Staff training should begin before the pool opens in the spring. It may continue in a fairly intensified form during the early weeks of the season, and should be continued throughout the summer to maintain lifeguards at peak efficiency. Special precaution should be taken to prevent lifeguards from becoming stale toward the end of the season.

A lifesaving or water safety instructor certificate does not guarantee qualification as a lifeguard. These certificates indicate that the person has the basic skills, but a lifeguard must be developed through training and experience. The pool manager or operator should not assume water skills on the part of the staff person. His training program should include testing, review, and instruction for improvement of water safety skills for all pool employees. He should allow time throughout the season for staff members to maintain and improve their aquatic competence.

The Council for National Cooperation in Aquatics published in 1964 an excellent book, *Lifeguard Training: Principles and Administration*, which describes principles and techniques for developing and administering lifeguard systems for pools and beaches. Training in first aid is an important aspect of staff training. The most highly skilled staff member should be designated to give first aid when necessary; however, all staff members should be trained in first aid skills for emergencies, particularly in areas pertaining to swimmers and swimming conditions.

Each pool has its own danger areas, which can be located from a study of accident records. An experienced pool manager or lifeguard can anticipate danger areas even in a new pool. Lifeguards should be made aware of these areas. A pool diagram showing danger areas and posted in the lifeguard locker room will serve as a helpful reminder.

The lifeguard's work schedule is another important safety consideration. One of the most difficult tasks for the lifeguard is to remain alert at all times. Several administrative techniques can be used to help maintain alertness. Lifeguards should not work more than an 8-hour day or more than a 48-hour week. Guards should be off at least one full day each week. Arranging for a week or at least several days vacation during the season is also a good management practice.

Under normal circumstances lifeguards should be given a rest period of approximately 10 minutes every hour. Some small pools find this procedure difficult. An alternate plan would be to clear the pool for 10 minutes every 50 minutes. One guard in a small pool, and perhaps more depending on size and shape of a large pool, should remain at poolside during the break period. It is also a good practice to have lifeguards rotate from one position to another every 20 to 30 minutes. The opportunity for movement and change of viewing area will aid in keeping the guard more alert. The rotation should always begin at the least important lifeguard station.

Volunteers are being used advantageously in many swimming pool programs, but they should not be given the responsibility of operating a swimming pool. They can perform a very fine service in instruction programs, competitive programs, water shows, and water safety demonstrations. Volunteers utilized in such programs should be given an extensive training program in pool safety. In many instances regular staff members and volunteers can jointly participate in such programs.

PUBLIC BEACHES

The quality of the water is one of the most important factors in the selection of a site for a swimming beach. It should be evaluated by chemical and bacteriological analysis. In addition, prevailing winds and water currents should provide continuous circulation of fresh water in the swimming area. Where good water circulation does not exist contamination of the water by swimmers is possible. There is little agreement as to standards of acceptable bacteriological quality for outdoor swimming areas. Health authorities should be consulted to determine acceptable local standards. Where small bodies of water are involved, chlorination and similar disinfectant methods have been successful in solving pollution problems.

In addition to the chemical and bacteriological quality of the water, attention should be given to the beach area both above and underwater. The area should be free from stumps and rocks, excess siltation, algae growth, aquatic plant growth, and dropoffs or severe grade changes.

Water clarity should also be considered. Absolute standards are difficult to establish; however, excessive turbidity presents an extremely dangerous situation. White sand on the bottom of the swimming area will greatly improve the lifeguard's visibility of the bottom.

Water fluctuation may present a serious safety problem on inland lakes. Lake bottoms which are safe at normal water levels may become extremelv hazardous when the underwater beach area is extended 100 to 200 feet out into the lake where potholes, stumps, and other dangers may exist. Diving areas, too, must be scrutinized carefully under fluctuating water conditions. It is important to know the exact water depth under diving boards and to prohibit diving when water becomes too shallow. The same safety criteria for swimming pool bathhouse facilities should be considered for the beach bathhouse. Bathhouse floors should be of non-skid material, the floor should have adequate slope to provide proper drainage, and the building should be well lighted and ventilated. A well equipped first aid room should be provided either within the bathhouse building or in another structure convenient to the swimming area. All lifeguards should have first aid training. Because most public beaches are located away from population centers, a mechanical or manual resuscitator should be part of the first aid equipment.

Elevated lifeguard chairs should be provided at all public beaches. The number of chairs should be determined by anticipated swimming loads rather than by distance. To guard adequately a heavily used swimming area, lifeguard chairs should be closer together than at a more remote swimming area which might receive relatively light use. A lifeguard should be responsible for no more than 200 swimmers. Signs should be placed on lifeguard chairs indicating to patrons that they should not converse with lifeguards on duty.

Rescue equipment needed at a beach area should be determined by the area itself. Safety equipment for inland beaches and ocean beaches will vary considerably. Most beaches should have a boat. For inland beaches the square bottomed, square sterned John boat is the most practical. Often this boat will be powered with a small outboard motor. Surf boats are usually double-ended dory type which can take high wave action and can be launched from the beach by trained lifeguards with minimum trouble.

The torpedo buoy is one of the best pieces of surf rescue equipment. Heaving lines or ring buoys, a surf board, and grappling irons are other pieces of rescue equipment found at public beaches.

Particularly at large public beaches, some form of communication between lifeguards is essential. Many beaches use two-way radios; others use a combination system of whistle and hand signals. Another valuable device is a portable, battery powered megaphone. With the high noise level from crowd, wind, and surf at ocean beaches, it is virtually impossible for a guard to be heard for more than a very short distance with a regular megaphone. The electrically amplified megaphone gives the lifeguard better control over swimmers and he doesn't have to leave his station.

All beach swimming should be restricted in some way so that lifeguards will have a reasonable span of beach area to control. At most ocean beaches this is done with markers on the beach, and swimmers must swim within the marked area. At inland lakes colored buoy lines can define the swimming area. The restricted swimming area should not be too large for effective supervision. A large inland swimming beach should be divided into sections so that one or two sections can be opened on low attendance days and during slack hours of peak attendance days.

Diving platforms, floating rafts, and piers should be constructed with quality materials and kept in first class condition. Care must be taken in the construction of permanent docks and piers so that a swimmer cannot be trapped underneath them. Diving areas should be designated with buoy lines and swimming should not be allowed in this area.

While lifeguard qualifications and staff training procedures are generally similar to those for the swimming pool, disparities do exist. Lifeguards employed on ocean and inland beaches, in addition to possessing the standard knowledge and skills required for their job, must know about current flows, tides, and surf. They must be stronger swimmers and be able to handle specialized ocean and surf rescue equipment such as surf boats and surfboards. The lifeguard must be aware of dangers presented by aquatic animal life and realize when they are a hazard to swimmers' safety. Lifeguards should be able to determine when swimming should be curtailed because of lightning, dangerous currents and surf, and other hazardous conditions.

Picnicking should not be allowed in swimming areas. Because litter, broken glass, and metal can tops resulting from picnics are potentially hazardous, drinks at beach refreshment stands should be served in paper cups.

Flotation devices, except for Coast Guard approved life jackets, should be prohibited from public beaches. There is a great danger of a nonswimmer or a weak swimmer being carried by currents to water over his head, and in an effort to return to safety, the person may lose control of the flotation device and drown.

Generally, long distance swimming should be prohibited. When distance swimming is permitted, the swimmer should be closely accompanied by a boat with two people — one to row, the other to watch and rescue the swimmer if necessary. An enforced buffer zone should be established outside the swimming area which prohibits boats from entering the swimming area.

Beaches should be cleaned daily, with special care taken to remove glass and other materials which might cause injuries.

SUMMER CAMP WATERFRONT

Factors of site selection, design, and construction for public beaches should also be considered in planning a camp waterfront. It is a good practice to locate a staff cabin overlooking the entire camp waterfront that can house the camp waterfront or aquatic director. The protection which this control affords during periods when the camp waterfront is unattended, particularly at night, is a positive safety factor.

Because of the program orientation of the camp waterfront as opposed to the unorganized recreational nature of public beaches, the design of the camp waterfront will generally include more dock area. The shape of the dock area will depend primarily on the function which it is to perform. From a safety standpoint the more swimming area that is enclosed by a dock, the easier it is to control. Having lifeguards located on a dock is better than guarding by boat because of the stability of the dock. Regardless of the dock design, the entire swimming area should be enclosed by a combination of docks and colored buoy lines. When the dock framework is wood, it should be fastened by bolts rather than by nails. This is particularly important for diving platforms where constant vibration will likely loosen nailed boards. No creosote lumber or poles should be exposed where campers can come in contact with them. Even seasoned materials treated with creosote will bleed" in hot weather and may result in severe skin burns.

Dock and pier walkways should be at least four feet wide. Planks should be spaced one-half inch apart to allow for drainage and ventilation, thus minimizing dry rot. Wooden materials chosen for docking should be as splinter resistant as possible. Steel, lightweight concrete, and aluminum are excellent materials for docks; although initially expensive, these materials are virtually maintenance free and worth the additional cost. All platforms, docks, and floats should be constructed with a minimum air space of one foot underneath. There should also be as little underwater construction and bracing as possible, consistent with support strength needed, to alleviate the danger of trapping swimmers beneath the structures.

Where unsatisfactory lake bottom conditions exist, crib areas with depths varying between two and one-half to three and one-half feet should be considered for nonswimmers. However, these crib areas generally are not completely satisfactory because of high maintenance factors and should be avoided if possible.

The camp safety program should begin with a classification test of all swimmers to determine what swimming areas can be used safely. The particular requirement of the classification test should be determined by the size and depth of the swimming area. A satisfactory deep water test in most instances is the demonstrated ability to employ two strong strokes for at least twice the longest dimension of the swimming area, plus an ability to relax and remain afloat in deep water.

To control campers in the swimming area, a combination of the check (or tag) board and buddy-check systems is recommended. Both systems are described in the American Red Cross manual, *Life Saving and Water Safety.* A control system for swimmers is not a substitute for, but a supplement to, an alert staff of lifeguards.

While there are many standards regarding the number of lifeguards needed on the waterfront during a general swim, there is general agreement that the ratio of campers per lifeguard should be very low. A standard of between 15 to 20 campers per lifeguard is most often quoted. The ratio should be lower for nonswimmers and beginners. There are two reasons for the much lower ratio for camp swimming areas as opposed to public swimming areas. First, the general swim period at camp is relatively short, about 45 minutes in length, and campers are in the water most of the time rather than lounging on the beach or at poolside. Second, camp administrators realize the tremendous responsibility they have "in loco parentis" and meet this responsibility by exercising great caution. A waterfront fatality is almost always inexcusable and will ruin a camp's reputation. At the same time camp waterfront regulations should not be so restrictive as to stifle the camper's enjoyment of aquatic activity.

In many camps some counselors are expected to serve as lifeguards. If these counselors are not regular members of the waterfront staff they should receive the same training in lifesaving duties as other members of the waterfront staff.

UNDEVELOPED SWIMMING AREAS

An undeveloped swimming area may be a deep pool in a stream or river, an abandoned quarry, a farm pond, a water hazard on a golf course, or long stretches of lake and ocean beaches. These areas are increasing in number. Farmers are encouraged to develop farm ponds for irrigation and conservation purposes. As of 1967, the Soil Conservation Service has assisted in developing more than one and one-half million farm ponds through the United States.[3] There are probably more than two million farm ponds in the United States today. Large inland lakes are being developed every year for power, flood control, potable water, and recreational purposes. Real estate developers recognize the value of homesites located on natural and artificial lakes. Even if it were desirable, attempts to legislate and regulate against swimming in these water areas would be unrealistic. There is no way to control swimming or to provide adequate supervision for these undeveloped swimming areas.

[3] Figures supplied by United States Department of Agriculture, Soil Conservation Service.

In urban areas where bodies of water present a hazard for neighborhood children, some control is necessary. Many communities have passed ordinances requiring that such attractive nuisances be fenced and posted. Residential swimming pool owners are faced with a personal liability problem. The responsible pool or pond owner will erect a fence around his pool or pond. If this is not done voluntarily, it should be required by legislation.

Park and recreation administrators are faced with a difficult problem when developing land holdings on large bodies of water. In areas of intensive recreation use, supervised swimming areas should be developed and managed consistent with good water safety practices. In more remote areas, recreation facilities do not generate enough public use to warrant the establishment of supervised swimming areas. Here the individual user's knowledge and skill must be relied upon.

Steps should be taken to make all undeveloped and unsupervised water areas as safe as possible. Where swimming conditions are dangerous because of drop-offs, steep underwater slopes, submerged stumps, or dangerous currents or surf, signs should be posted stating that swimming is prohibited because of unsafe conditions. In areas where physical conditions of the water and beach areas are safe for swimming, rules for swimming safety should be posted. Rescue stations consisting of, perhaps, a ring buoy with rope and a reaching pole should be located at strategic points around the body of water. In addition, the location of the nearest telephone and emergency phone numbers should be listed. Such precautions should be taken at all normal access points to a body of water which might be used for swimming.

Normal means of controlling undeveloped swimming areas are impractical and the number of undeveloped swimming areas is growing at a rapid rate, thus increasing the danger of accidents and drownings. Educational programs designed to develop skill and impart knowledge about water safety are the key to this situation; they should include learn-to-swim programs; water safety demonstrations; emphasis through public service announcements in newspapers, radio, and television; and emphasis on need for adequate legislation.

Many swimming teachers suggest that instructional programs begin with "drownproofing" techniques. "Drownproofing" is learning methods of surviving in the water when the individual cannot swim. "Drownproofing" utilizes the natural buoyancy of the body and controlled breathing to make it possible for the individual to stay afloat for hours. The skill is quickly and easily learned with little instruction and practice. Rather than replacing the conventional learn-to-swim program, drownproofing should be a supplement when limited time is available for swimming instruction.

Responsibility for water safety should begin with parents. They should see that their children learn to swim at an early age. Governmental, private, and public youth serving agencies provide learn-to-swim programs in almost every community. Parents should learn to swim themselves and obtain at least an elementary knowledge of lifesaving and water safety techniques to help protect their children. For too long, learn-to-swim programs have been geared to the instruction of children. Many adults can benefit from such programs. A number of agencies have successfully sponsored family learn-to-swim programs.

When private residential or home pools are used in conjunction with an organized community, school, or other learn-to-swim or recreational program, the same physical and supervisory safeguards should be provided as at public pools.

Every child should have an opportunity to learn to swim or to better his swimming ability while in school. It is alarming that so few of our schools provide swimming facilities. Large portable swimming pools can be used very effectively to provide programs in elementary schools. Operation Waterproof 4th Grade is a good example of such a program. More of this type program to reach larger segments of the population is badly needed.

In recent years large portable swimming pools and semipermanent pools which require about three days for erection have become popular in large cities where permanent neighborhood pools are impractical. While the portable swimming pool should not be conceived as a substitute for a permanent pool, it can enable schools and park and recreation agencies to provide swimming instruction and recreational swimming opportunities to more people.

The community should share in the responsibility for aquatic safety. Often an aquatic council or water safety committee can be organized in a community to conduct cooperative water safety programs. Coordinated efforts by the many adult and youth serving agencies in a community can yield dynamic results. Better swimming facilities, swimming programs for the handicapped, learn-to-swim programs, and legislation governing safety in swimming are all logical outgrowths of concerted cooperative efforts by citizens of the community. It is indeed unfortunate that sometimes it takes a drowning accident to shake the complacency of a community to initiate a worthwhile water safety program.

Summary

There are no easy solutions to the safety problems created by the tremendous growth and interest in recreational swimming in the United States. Solutions to these problems will be solved only through dedicated effort and hard work by all those concerned with water safety. Recreation and park, school and agency administrators must be particularly aware of the potential dangers involved with recreational swimming and in every way possible develop and operate safe swimming facilities. However, it must be emphasized that this must be accomplished without detracting from the natural enjoyment derived by participants in this delightful pastime.

References

American National Red Cross. *Life Saving and Water Safety.* Garden City, N.Y.: Doubleday & Co., Inc., 1956. 267 pp.

American Public Health Association. *Suggested Ordinance and Regulations Covering Swimming Pools.* New York: The Association, 1964.

Bureau of Outdoor Recreation. *Outdoor Recreation Trends.* Washington, D.C.: United States Department of the Interior, 1967. 24 pp.

Council for National Cooperation in Aquatics. *Lifeguard Training: Principles and Administration.* New York: Association Press, 1964.

Gabrielsen, M. A.; Spears, Betty; and Gabrielsen, B. W. Safety in aquatics. *Aquatics Handbook*, pp. 8-18. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1960.

Pohndorf, Richard H. *Camp Waterfront Programs and Management.* New York: Association Press, 1960. 266 pp.

Schneck, Karl R. *Program Planning for the Camp Waterfront.* Allentown, Pa.: Jacobs and Bachman Press, 1951.

Stott, Charles C. *Evaluating Water Based Recreation Facilities and Areas.* Washington, D.C.: National Recreation and Park Association, 1967.

Webster, Daniel P. Pool drownings and their prevention. *Public Health Reports* 82:587-600, no. 7, July 1967.

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Springboard and Platform Diving

ANNE ROSS FAIRBANKS, M.S.

35

The consensus of divers, teachers, and coaches today seems to be that (1) accidents are fewer than in years past, and (2) safe equipment, proper progression in teaching, sensible conditioning, and alert supervision can prevent almost any diving accident. The accidents which are difficult to predict and prevent are those of psychological failure of the diver; holding back; hesitation when faced with a new direction in space; "freezing up" of muscular action; and disorientation in space. Accidents which *may* occur stem from poor teaching or supervision, improper installation and care of equipment, and lack of mental readiness of the diver.

EQUIPMENT AND SURROUNDINGS

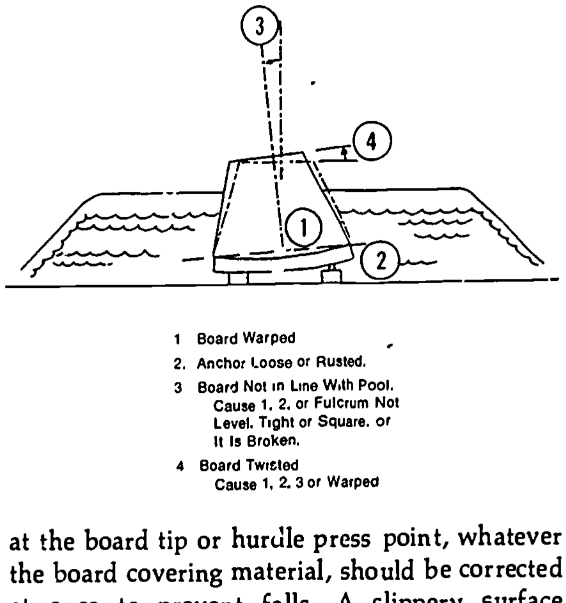
In analyzing diving safety we must consider the board; movements in the air; the contact or impact of the diver at the surface and through the water; and finally, the bottom of the body of water.

Board

Safety of boards and platforms concerns surface, stability, pitch, and position in relation to surrounding walls and other equipment. Boards should be anchored firmly at the fixed end with bolts through the deck. The fulcrum should be properly centered, level, and at exact right angles to the board. The pitch of the board should be level, or no more than one inch above the horizontal at the tip. If the fulcrum is adjustable the mechanism should be such that the pitch of the board is not affected by different positions of the fulcrum. An upward pitch can cause a diver to take off at too straight an angle and come back down on the board. It can also disturb a diver not used to this pitch so that his timing is affected and he mistimes his takeoff. A downhill board is also difficult to control. The diver's tendency is to be thrown out and over, or, if he overcompensates, to take the dive up too straight.

All fittings should be checked for tightness. Loose fittings may cause a torque in the board, throwing the diver to one side and perhaps causing lateral instability. If the board is allowed to slip a little to one side of the fulcrum and is no longer at right angles to the pool end, this will strain the board and the fulcrum. An unwise practice is mounting a new board on old fittings. This is done for economy reasons, but frequently there is no economy in the subsequent problems which come with faulty or worn-out underpinnings.

The surface of the board should be nonslippery. The most satisfactory type of surface seems to be a commercial treatment of sandpaper-like material used on wood or fiberglassed boards, and a nonslip paint surface on aluminum boards. Platforms must also be nonslippery for runs and takeoffs. Cocoa matting covers, formerly common, become slippery and develop holes particularly at the board tip. Cocoa matting also can loosen and fray. Any bad wearing



1 Board Warped
2. Anchor Loose or Rusted.
3 Board Not in Line With Pool. Cause 1, 2, or Fulcrum Not Level, Tight or Square, or It Is Broken.
4 Board Twisted Cause 1, 2, 3 or Warped

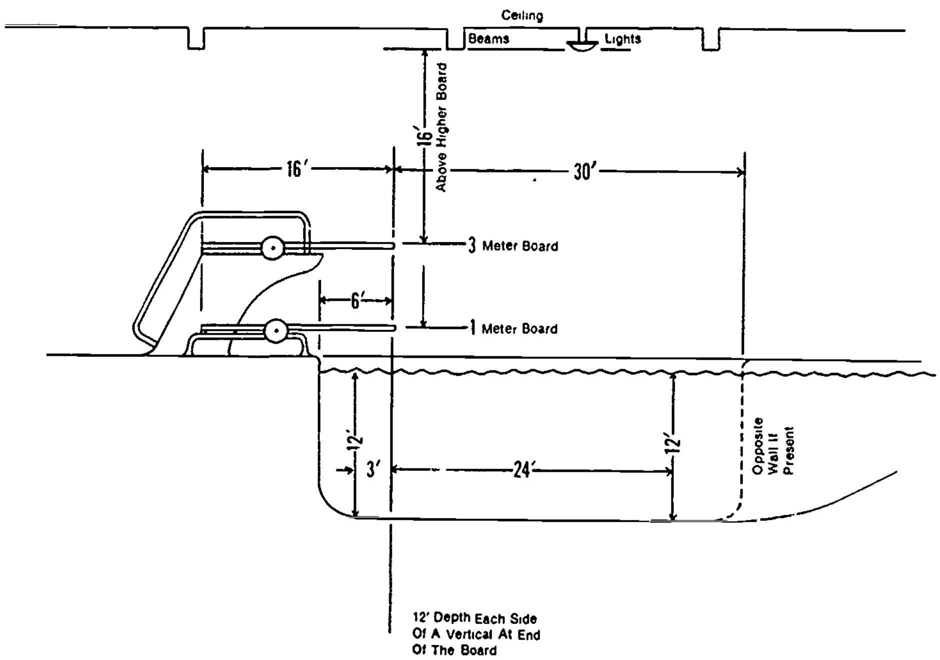
at the board tip or hurdle press point, whatever the board covering material, should be corrected at once to prevent falls. A slippery surface makes a diver apprehensive, and very definitely disrupts his takeoff cordination. This kind of worry can cause many accidents — on the board or platform itself, at the edge, or at the surface of the water, after hitting it badly.

The flexibility and timing of a springboard varies from the fast, hard bounce of a short wooden board to the deep, soft swing of the latest aluminum boards (similar to the bounce timing of a trampoline bed). In addition to the inherent flexibility of any board, there are fulcrums which are movable, adjusting timing to the taste of the diver, his weight, and strength. Variables in flexibility or board timing are not dangerous factors in themselves — they become a hazard only for the inexperienced diver. One who is accustomed to a fast bounce can be thrown completely out of timing when using a soft flexible board for the first time. A similar problem arises in competitive or exhibition situations where two divers following one another have very different fulcrum preferences, and the second diver fails to readjust the fulcrum. This kind of situation can cause injury from board or water contact.

The antidote here is good coaching. A diver must be educated to try out any alien board by diving with easy takeoffs; to learn what he has to do within his own timing to adjust quickly to a board which cannot be adjusted, and which is very different to him; and to check a movable fulcrum before each dive to see that it is set correctly for him.

Next to be considered is the relationship of this board or platform to surrounding walls, equipment, and water. First, the board or platform must extend a safe distance out from the end wall to which it is attached. If it is too close to this wall, divers may hit it underwater since many dives tend to curve back toward the wall underwater. This is particularly true of inward dives, half twists, and back dives. Safe specifications for the distance between the end wall and board tip are six feet for all heights up to ten meter platforms, when six and a half feet (2 meters) are recommended.[1] Because skilled divers need far greater unobstructed headroom, diving areas, and water depths than do novices, purely recreational pools should not be used for competitive diving unless their dimensions conform to such recommended minimum specifications.

[1] Specifications mentioned are recommendations compiled from *AAU Official Handbook — Swimming, Diving, Water Polo* (New York: Amateur Athletic Union, 1968) and *Collegiate-Scholastic Swimming Guide* (Kansas City, Mo.: National Collegiate Athletic Association, 1968).



If there is a ceiling overhead this should be at least 16 feet from the surface of the board. Ceilings should also be free of beams, hanging lights, or any other obstruction, at least in the path of diving (judged to be about 12 feet). It is doubtful that there have been accidents involving ceiling contact, but low ceilings are mental hazards inhibiting to the diver. They can definitely contribute to a poor dive start and cause an accident on the board or at the surface of the water.

Related to hazards in the air are positioning and strength of lighting. A glaring light in the eyes of the diver, either at the point of takeoff (forward or backward) or at the peak of the dive, can be blinding. Occasionally there is a kind of lighting which causes the surface of the water to be invisible. This makes the timing of the dive finish difficult to plan.[2] In looking very hard at an invisible surface several years ago, one diver suffered a detached retina.

Other dimensions in board placement important to safety in diving are lateral space (10 to 15 feet) and space directly in front of the board (25 feet for one meter, 30 feet for three meters, 40 to 50 feet for platforms).

Bottom

Next to consider is the depth of the water, and the shape and surface of the bottom. Depths recommended are 11 to 12 feet for one meter boards, 12 for three meter boards, 15 for platforms. These depths should cover safe dimensions in the general landing area, as noted on the specification chart above.

If the water is not at these recommended depths the diver is subjected to certain strains (of the lower back, wrist, ankle, or knee) either from hitting the bottom or from avoiding it. With hard hits, bruises on hands, head lacerations, and concussions can result; other possibilities are neck injuries and loss of teeth.

The problem of shallow depth does not bother the beginner as much as the better diver. When an entry is well done a diver goes to the bottom in a direct line with much less resistance than

[2] "Mechanical surface agitation is recommended under the diving facilities to aid divers in their visual perception of the surface of the pool." American Athletic Union, *op. cit.*, p. 21.

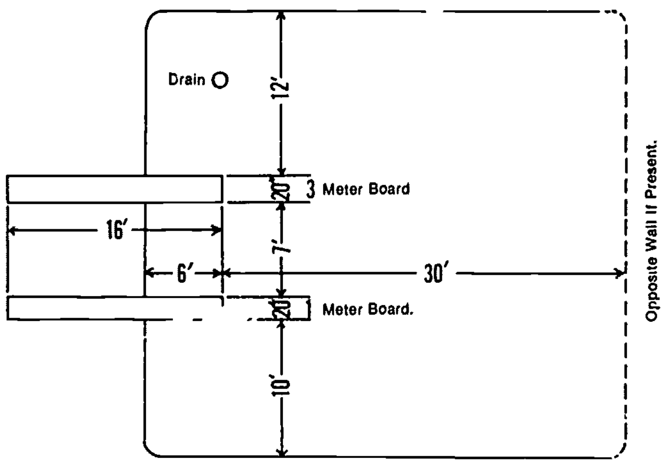
the splashy entry of the novice. However this "good" dive can happen by chance to the novice, and he may crash unexpectedly into the bottom. There are several precautions which help avoid this: all divers, beginners and otherwise, should be taught to land correctly on the bottom; divers should be familiar with their own facilities' size and shape; they should be warned to try out all new facilities with caution until they become acclimated to the difference in depth or shape. Divers develop a sense of time interval between the time they touch the water and the time they contact the bottom. This they develop in their home facility if they dive frequently. A source of accidents is the change of pool from deep to shallow. The youngster used to 12 feet of water beneath him suddenly practices or competes in a nine foot depth. At nine feet his arms are relatively relaxed, unconsciously expecting three more feet of fall. It is the coach's responsibility to warn divers to get accustomed to the depth by falling in the water a few times and taking several easy dives. After 8 to 10 cautious dives, he will be relatively safe: he has "re-set" his time interval reaction.

The problems in shape of bottoms are "spoon" bottoms and their variations. Not only do these often cause a shallowness where a diver will logically go, but also pools shaped this way place the outlet drain at the deepest point — under the board. This can be a finger catching hazard as well as an abrasion problem if the edges are uneven. The backyard pool is currently the chief offender in the problems of bottom shape.

Surface problems are slipperyness caused by poor maintenance or by inherently slippery wide tile. Pools which have wide tile lane lines built in can be bad for divers. Occasionally the problem is roughness, caused by new curls of cement, uneven seams in metal pools, or uneven tile. In natural situations the bottom surface problems are multiplied: rocks, reeds, soft mud, shells, sharp stones, and littered areas with the chance of broken glass, cans, fish hooks, old anchors. Camp and outdoor recreational facilities must be carefully inspected at the beginning of each summer season. The fact that lake and salt water areas are sometimes murky and dark makes it even more essential to know exactly what is on the bottom.

Another important aspect of equipment placement is obstructions beneath the surface, such as uneven rock ledges in quarry sides; poorly constructed floats or piers with protrusions; and anchor chains or guy lines from floats which vary in position with wind and tide.

The best diving area is the separated or separate diving pool, such as available in "L," "T," or "Z" shaped pools. This allows for deep water space not involving any swimmers, constructed specifically for diving.



SAFETY PRACTICES

Proper supervision

Frequency of accidents will rise if children and adults are allowed complete freedom of diving equipment without control. Experienced lifeguards know well that the area of the diving boards is the spot where they can expect trouble unless safe rules are set up and enforced. These are the common sense rules:

1. Allow only one on a board at a time.
2. Swim away from the board to the nearest ladder immediately.
3. Do not swim under boards.
4. See that the preceding diver is well away before diving.
5. Dive only from the end of the board, not from the side.
6. Never bounce from one board to another.
7. Do not swing by the arms from the high boards.
8. Do not bounce board excessively.

Most of these rules are self-explanatory. In specific situations special rules can be made. There are occasions when boards must be closed because of overcrowding, small swimming areas, or limited supervision.

Teaching of safety

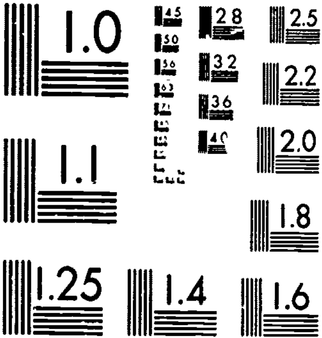
In the process of teaching and performing diving there are very specific concepts of accident prevention which make diving both safe and easy. These concepts can be divided into two general areas: (1) pace at which a diver is taught and coached (i.e., progression), and (2) specifics which the diver learns to make him a safe performer. The degree to which a teacher can analyze and judge a diver's performance in order to decide "pace," and the degree to which a diver can respond to his own checks and balances in movement, will determine the safeness of his diving performance.

Pace. Pace signifies a little more than progression. While it means building from fundamentals, and being sure that basic dives are learned in logical sequence, it also has to do with how fast these things are taught, how much time must be spent for different people at different levels, and recognition of influencing factors such as unusual fatigue, time of year in academic pressure, onset of illness, outside psychological stress, parental pressure or indifference. In competitive situations pace is related to the dates of the meets. This can be very dangerous, when motivation is keen and performance is not yet safe. Coaches and divers tend to push too hard and too fast. Weather is a pace factor: wind and cold cause tightness and strain. The discomfort and difficulty in executing hard dives under these conditions make divers hurry and become careless; it becomes hard to feel balance and proper timing.

It is a wise and perceptive teacher who can evaluate these various factors of pace in teaching. He must be constantly flexible and sensitive to everything in the environment of the diver.

Diving specifics. Focus, or visual orientation, is a specific for every diver from beginners onward. This means awareness of the end of the board at all times in forward approaches. It means judging angle of takeoff; certain checkpoints in controlling dives from heights and dives involving great change of position; certain checkpoints for "breaking" into a straight position from twists and spins; and most definitely checkpoint and aim for every entry. A "blind" or not-looking diver is an unsafe diver. All dives are adjustments in balance, controlling the force imparted to the body of the diver at takeoff.

A good part of this adjustment is *sensitivity to balance*, a second specific for every diver. From the time he begins to walk forward on the board or begins his run on the platform or arm swing, he is changing his balance, shifting his center of gravity. If he can become aware of these balance changes, he can change, correct, and keep his actions safe in terms of hitting the board or contacting the water improperly. He learns that whatever happens, he himself has done it; therefore, he can also change and control it. He must be made aware of balance and



OCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

his specific control through his body alignment, use of feet and ankles, and head and shoulder positions.

In simple, less theoretical terms, the diver is taught to keep his eyes open and to have control of his movement at all times. He doesn't run madly off the board; rather, he walks, hurdles correctly, and lands in balance, pressing through to his heels. He springs into an arc, actually a parabola, to land in the water two to five feet from the board tip.

In emphasizing the importance of focus and balance the teacher looks to the center of gravity of the diver as he performs. If he is passing very close to the board, his problem is in his takeoff. Watch his action there and judge what it is that interrupts the logical arc which should follow a balanced coordinated takeoff.

Contact with the water is a matter of correct dive execution which finishes going through the water at an angle slightly less than vertical, whether head or feet first. The diver who tries to dive at ninety degrees inevitably rides over as his body motion continues in the direction of his rotation. In addition, his arms and upper body are slowed in their rotation as he enters the denser medium of water, and the lower body, still in air, tends to ride over. Ear injuries occur occasionally among divers learning multiple twisting-spinning dives. These happen when the twist is incomplete or the diver "lost," and he hits the water squarely on the side of his head.

The next problem is underwater. Generally there is the tendency for the beginner to lift the head and come up too soon, causing strain in the lower back. The remedy is to carry the line of the dive down deeper, preferably to the bottom if suitable. This means a good strong stretch, and tension in the diver's position, which is excellent entry procedure anyway. In advanced diving techniques there are many alternate underwater maneuvers, which, if mastered, make very clean entries. These maneuvers, however, should not be attempted by average divers since they require a high degree of coordination and reaction time.

Another contact consideration is the alignment of the arms and shoulders with the head on head-first entries. Arms should be over the ears, together, and stretched. This is particularly essential from three meters upwards. A wide arm position or out of line position may mean a hard hit on an unprotected head, or neck injury, or shoulder injury if an arm is forced out of line. From platforms a common complaint is bruised hands and foreheads, the impact driving the hand into the head. This is easy to prevent by a firmer stretch and a clenched fist position of the hands.

Conditioning

Conditioning and physical fitness as related to diving should mean strength, flexibility, and good health to accomplish the gymnastics of diving, whether from a one meter board or a ten meter platform, without injury. The activity itself is a good conditioner. As a diver takes longer workouts and his dives become more difficult, he becomes stronger.

There are those who are taught too quickly, who have perhaps great facility in the mechanics of movement but not matching body strength. These may need particular strengthening exercises. Some may have inherent weaknesses which need attention, principally back, abdominal, leg, foot, and upper arm action. Lack of flexibility is a problem with many boys: ankles, hamstrings, back, and shoulders.

More advanced divers use conditioning exercises for speeding up the ability to accomplish difficult maneuvers and to enable them to withstand the rigors of long, concentrated periods of diving. The use of spotting belts and trampolines is both a quick learning procedure and a safe conditioning practice.

A factor in accidents is fatigue, and it usually affects the advanced diver. He is the one who is highly motivated to go beyond the limits of his strength. Diving is a skill of precision and coordination more than one of extreme physical strength. Failure in judgment and timing due to fatigue can result in a serious accident for the highly skilled performer. Prevention lies in a combination of astute perception on the part of the coach, and recognition of signs in himself by the diver. "Buckling," or collapsing in the knees on takeoff, is a very definite sign of trouble ahead. Other signs might be difficulty in holding tensions in positions or at point of entry; muscle twitching, usually in the leg muscles; indecision, or frequent balking; emotional reactions to criticism.

Diving need be no more dangerous than any other sport or daily activity. The risk of accident is related to poor equipment, hasty and ill-advised teaching, lack of supervision, and lack of common sense.

References

Amateur Athletic Union. *AAU Official Handbook — Swimming, Diving, Water Polo*. New York: The Union, 1968.

Armbruster, ˜. Allen and Billingsley, Hobard. *Swimming and Diving*. 4th ed. St. Louis, Mo.: C. V. Mosby Co., 1968.

Fairbanks, Anne Ross. *Teaching Springboard Diving*. Englewood Cliffs, N.J.: Prentice-Hall, Inc. 1963.

Hazelton, Sydney C. and Pulis, Clifford A. 4th ed. *Diving Manual For Instructors*. Hanover, N.H.: Roger Burt Printing, Inc., 1956.

Moriarty, Phil. *Springboard Diving*. New York: The Ronald Press Co., 1959.

National Collegiate Athletic Association. *Collegiate-Scholastic Swimming Guide*. Kansas City, Mo.: The Association, 1968.

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Water Polo | ARTHUR D. MINDHEIM, M.S.

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Water polo has evolved from a relatively rough, bullish game of 20 to 30 years ago to the rather highly skilled, fast moving sport it is today. The old style game which permitted players to take underwater not only the ball but each other is now past. Years ago, broken noses, cut and blackened eyes, and facial and body scratches were common. They were the days of three forwards, three guards, and a goalie restricted by the four meter line. In today's sport the team possessing the ball must play as though it has six forwards while the team on defense must react with six guards. The goalie can come out as far as midcourt. All players must be able to shoot and score as well as guard the opposition. No longer is the "hole forward" type of game played; it is useless against a fast breaking, well-conditioned, mobile team.

There are hazards in modern water polo but possibly not as many as in the original game. Proper conditioning and self-defense skills are significant controls in minimizing accidents. Hazards are always present no matter how much time and effort go into their elimination. It is up to the players, coaches, and officials to make sure that no new, unnecessary dangers are introduced into the game.

On the premise that a moving target is hardest to hit, proper conditioning must be the prime deterrent to water polo accidents. Well-conditioned, highly skilled players who have found themselves fatigued and completely ineffective after 15 minutes of scrimmage probably did not know how to pace themselves in a game situation or became frustrated at constantly losing the ball to a less skillful swimmer. Problems that are common to players are a lack of leg power and inability to work in short spurts with constantly changing direction. To improve these skills, players can use a variety of water polo drills.

In today's sport it is illegal to take the ball underwater in an effort to deceive the opposition. When a player approaches the ball, he must play it and not some part of the opponent's body. The dead ball penalty point, just recently introduced, not only speeds the game but effectively reduces body contact, such as holding.

Probably the most important deterrents to accidents are the player's emotional stability and self-discipline. The hardest thing for the beginner to learn is that he will be fouled often. Each foul gives his opponent an advantage and it is quite evident to the novice that his opponents do take advantage of him. Because of water polo's unique lack of multiple referees and umpires, many fouls are undetected. Only in high school and collegiate water polo are two referees used; in national (AAU) and international (FINA) competition, only one referee is used. It is impossible on a basketball court for officials to notice all rule infractions; in water polo, with more players and the water medium, even two referees can miss underwater action.

Types of accidents

The following are accidents that have actually occurred in water polo and suggestions for minimizing them.

1. The white of a player's eye was cut by an opponent's fingernail while playing the ball. This occurrence caused the player to be out of competition for four months, and it was a year before the injury healed completely. Short fingernails could have minimized the danger. It is the referee's responsibility to check for rings, jewelry, and long fingernails that might endanger players. In addition, because the game was played under a minimum of pressure for the team of the injured player, perhaps he was not exerting as much effort and was not in as ready a position as he would have been had the game been an important one.

2. A player's nose was broken from a closed fist blow by an opponent during a tournament. The experienced player who was hurt had entered the tournament insufficiently conditioned. Rather than chase his opponent up and down the pool, he constantly held onto the player. This annoyed and frustrated his opponent, who consequently lost control and punched his opponent in the face when the referee (only one in this game) was not looking. Neither player was right. Had the injured player been in good physical condition he would have chased the opponent, as he was the faster swimmer. The player who caused the injury should not have lost control of his emotions. One can also fault poor lighting as well as the tournament officials and the referee, who is responsible for making sure that the game is under control and played according to the rules. Because of the poor position of the pool, the sun shone on the water, which made it virtually impossible for the referee to follow and control the whole game.

3. In another incident, a player was kicked in the groin, a blow severe enough to make him almost unconscious. The kick was probably due to the constant harassment between the two players in an attempt to unnerve each other. The player inflicting the blow either lost his self-control or felt that his opponent "had it coming" for reasons known only to himself. On the other hand, the injured player's lack of self-defense, such as keeping his hips high while guarding, made him vulnerable to the blow.

4. Certain incidents are solely accidental. For example, when two teammates broke for the same opening while swimming on different but converging courses, one was struck in the eye by the other's thumb. Severe conjunctivitis and a black eye resulted.

5. In another game, a player who previously had had plastic surgery on his cheekbone was accidently struck in the face. It was a glancing blow that probably would have been unnoticed had it happened to anyone else. Fortunately, no permanent damage was done, but the injured player was unable to participate further in the game.

6. Another incident involving a blow to the face and nose resulted in the injured player being removed from the game and missing the remainder of the tournament. Lack of conditioning was probably the cause. When interviewed, the player remarked that he "never saw it coming." However, his team had been practicing only twice weekly for a month prior to playing in the tournament.

7. A common injury in early practice sessions is a jammed thumb. This seems to be the result of scrimmaging early in the season before good ball control and handling had been established.

8. Another early season injury is a strained throwing arm, which is occasionally accompanied by a sore elbow. This is caused by throwing too often in the early season and throwing too hard prior to a warm-up.

9. An accident common to the novice is being kicked in the mouth by the heel of an opponent while chasing him down the pool. A player must be taught to pursue to the side and

keep his arms beneath him with elbows bent to prevent the pursued player's feet from driving into his face and abdomen.

10. An accident that was the direct result of one player, a guard, harassing his opponent, a forward, happened in the following manner: the guard constantly pressured the forward throughout the game by pushing, holding, and leaning on him. Annoyed, the forward was determined to "get even." He waited until the action and the referees were at the far end of the pool. He then swung a backhanded closed fist at the guard. However, at the time of the swing and resulting blow, the guard had turned his back on the forward in order to communicate with his goalie. The blow landed in the back of the guard's head, breaking several bones. The forward was disqualified for the season.

Most injuries result from one or more of the following causes: playing at less than full speed against less skillful opponents; lack of physical conditioning; occasional overaggressiveness on the part of some players; aggravating an opponent to the point where he loses self-control; improper playing techniques because of lack of experiences; and practicing too hard in the early part of the season.

The majority of injuries occur to the head and face. Just what can be done to reduce accidents is debatable. High school and college rules require two referees for every game, each with a specific part of the pool as his prime responsibility. Of the 10 examples cited, only in one instance — the last — were two referees present. In the second, fifth, and sixth examples, it was difficult for the referees to see easily the entire pool because of poor lighting.

Thought has been given to permitting the goal judges to act as additional referees, but this would probably be more confusing than helpful. If the referee could have a walkway elevated to five or six feet above the deck, he would probably have a better overall view of the pool, but this would be impractical to construct because of high cost and relatively few hours of pool usage. As the caliber of water polo increases and the facilities become more modernized, it is hoped that the accidents will decline. A new coach who has little background in water polo yet wants his team to play is responsible for learning from more experienced coaches the fundamentals not only of skill and strategy, but also of safety.

References

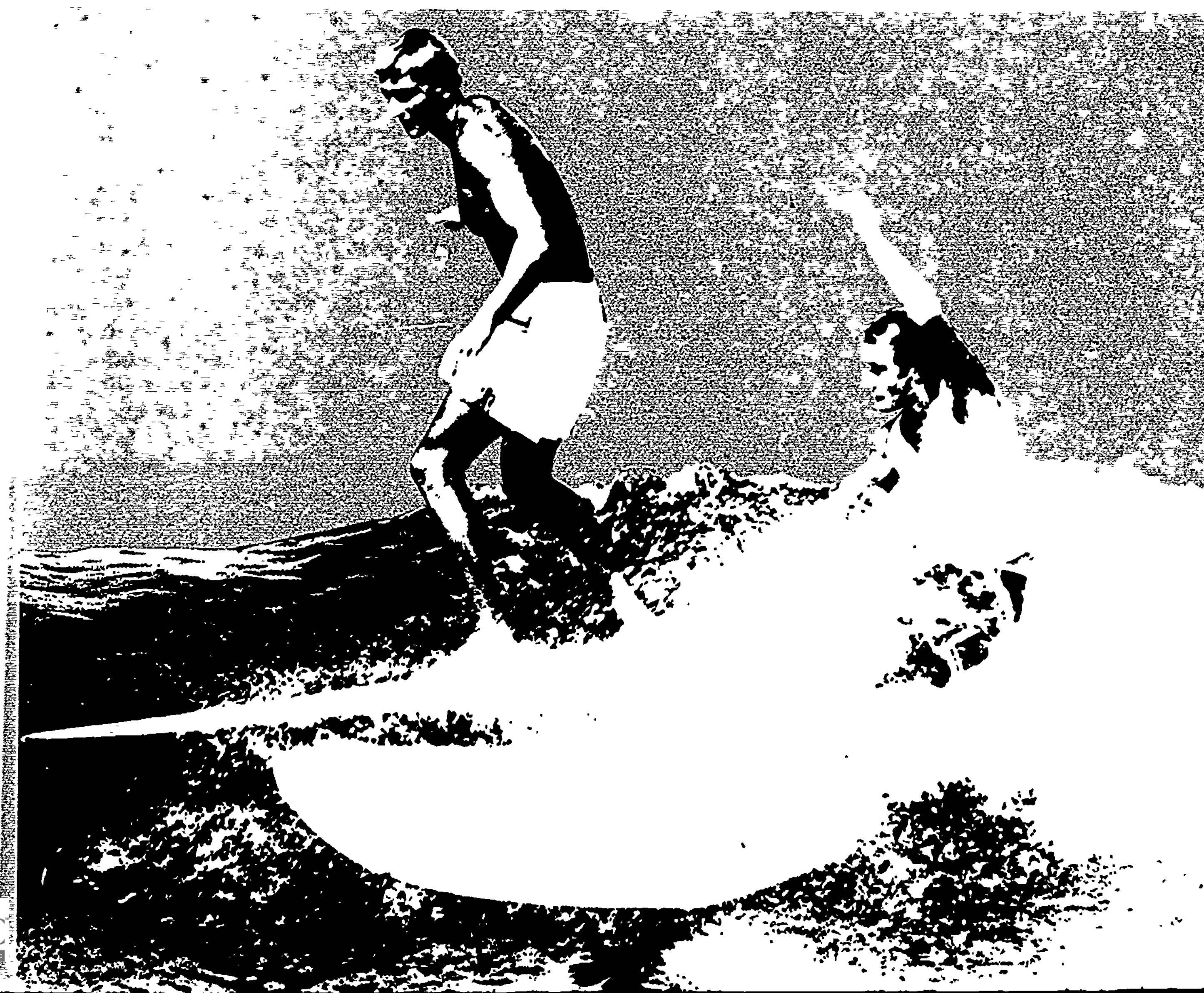
Antilla, William K. *Water Polo Drills and Playing Hints.* Palo Alto, Calif.: The National Press, 1964. 159 pp.

Barr, David. *A Guide to Water Polo.* New Rochelle, N.Y.: Museum Press Ltd., 1964. 123 pp.

Hines, Charles. *How to Play and Teach Water Polo.* New York: Association Press, 1967. 127 pp.

Rajki, Bela. *Water Polo.* Budapest, Hungary: University Press House, 1958. 119 pp.

SAFETY IN OPEN WATER AQUATIC SPORTS



Small Craft Safety | CHARLES W. RUSSELL

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Since the turn of the century, the annual growth rate of pleasure boating and its related activities has far outstripped that of any other outdoor recreational activity. Individually and in groups, millions have turned to the comparative freedom of the water in pursuit of relaxation and recreation. Today one out of every four Americans — young and old, male and female, from all walks of life — go boating more than just a few times a year, and this statistic does not include the nearly five million young people who enjoy some small craft boating experience in camp programs each summer. The craft used by boating enthusiasts range from small pram just large enough for a single occupant to operate in calm waters to ocean-going vessels that require a multi-membered, highly trained crew. The urge to get afloat has made boating one of the nation's leading family recreational activities.

Although certain geographical centers tend to attract a large concentration of watercraft because of scenic, fishing, cruising, or other features, the opportunity to participate in recreational boating is no longer restricted to those who live near the water. Every sizable population grouping in the United States today finds itself within easy access to recreational boating areas; in addition, mobility of equipment, provided by trailer and cartop rigs, has greatly extended the operational range of the small boat owner. This increased boating activity means that the boat owner must become better informed about federal and state regulations, equipment, piloting, and emergency procedures than was necessary for the casual boatman a few years ago.

Recreational boating is expected to increase in popularity even more sharply in the next several decades. Stimulating the increased activity are a highly competitive industrial promotion by big corporations and an energetic development of outdoor recreational facilities by all levels of government.

THE SAFETY PROBLEM

The rush to the water by millions who are not prepared to cope with the hazards of an unfamiliar aquatic environment has created special safety problems. The variety and complexity of boating accidents are not generally known by the beginning boatman, nor are they fully appreciated by many operators with years of experience. There is no simple solution to the problem, but a study and analysis of all the elements involved in small craft accidents are tabulated in the annual U.S. Coast Guard publication, *Recreational Boating Statistics* (CG-357). This book provides data and information for the formulation of educational, engineering, and enforcement programs. (Note: The Recreational Boating Act of 1958 requires the Coast Guard to compile and publish an annual report on boating accidents. A reportable accident is one in which a life has been lost, a person has been incapacitated for at least 72 hours by injuries, or the craft has sustained property damage in excess of $100. The reports are released on May 1 for the preceding calendar year and may be obtained from the nearest Coast Guard Office.)

Boating fatalities by drowning constitute approximately 20% of the total number of lives lost each year as a result of water accidents. In areas where small craft concentration is high, the number of lives lost in watercraft mishaps may equal or even exceed the number of drowning fatalities due to all other causes. According to the Coast Guard recreational boating statistical report approximately 85% of the boating fatalities result from capsizing, falling overboard, swamping, or sinking of a craft. In most sports or recreational pursuits, personal safety is directly related to the individual's ability to make decisions and perform skills; the quality of the equipment also is important. In boating, more than good judgment, skill, and good equipment are necessary to insure safety. The boat occupants must also be able to handle themselves in water, in the event that they should lose contact with the boat.

Because of incomplete or inaccurate reporting it is often difficult to pinpoint the specific cause of a boating accident. Sometimes, as in cases where there are no survivors, the facts are obscure or unknown. Whatever the reported cause, it should be remembered that the so-called cause simply triggers the casualty. For example, in boating accidents, impact is the primary cause of injuries but not of fatalities. Asphyxiation by drowning is the leading cause of boating deaths; capsizing and falling overboard, often referred to as the leading "causes" of boating fatalities, merely trigger the asphyxiation. The practice of basic water survival skills could drastically reduce the number of deaths from such accidents.

Fatal boating accidents

The makeup of a fatal boating accident can be rather complex. An overboard accident may result from sitting on the gunwale of a boat during a high speed turn by a person who is not wearing a lifejacket and who does not know how to swim. The elimination of any one or all of the contributing factors could have prevented the fatality.

Analysis of any boating accident will reveal that the elements triggering a casualty fall into four basic categories: (1) lack of rescue and self-rescue skills, (2) faulty operation, (3) faulty or improper equipment, and (4) environmental hazards. If the incidence of small craft accidents is to be reduced, each of these elements must be of primary concern to the boatman. He should know how to care for himself in the water and be able to help others who may need assistance. He should know how to pilot and operate his craft in a manner that does not jeopardize himself, his passengers, or the occupants of other craft. He should know how to select the proper craft and equipment for the conditions under which they will be used. He should be aware of the dangers of adverse weather and water conditions and know how to cope with them when they cannot be avoided. Since injuries or fatalities may result from one or more of the foregoing elements, the following information emphasizes basic guidelines that have been fairly well established for each category.

Self-rescue and rescue skills

The fact that approximately 85% of all boating fatalities are caused by asphyxiation by drowning emphasizes the importance of knowing how to apply swimming skills for survival and rescue purposes. An unexpected capsize may cause panic or irrational behavior even among good swimmers unless they have been preconditioned for such an experience by capsize or overboard drills under controlled conditions. Generally, survival swimming skills are modifications of elementary strokes performed while the individual is in the prone or back floating position. The application of the basic skills will vary depending upon the amount and type of clothing the overboard victim is wearing. For example, a duck hunter dressed in cold weather clothing and wearing hip boots will not be able to perform a leg kick as effectively as a sailor lightly clad in shorts and canvas deck shoes, but both would employ various combinations of basic aquatic techniques to remain afloat. These techniques, taught in most communities by YMCA and Red Cross chapters, include:

1. Breath holding and rhythmic breathing
2. Jellyfish float
3. Floating in the prone and back positions with minimum use of the arms and legs, combined with breath holding and rhythmic breathing to increase body buoyancy
4. Bobbing in deep water combined with breath holding and rhythmic breathing
5. Bobbing in shallow water (6 to 8 ft.) combined with a push from bottom and rhythmic breathing; this procedure can be used to work one's way toward water of standing depth
6. Elementary backstroke, with supporting as well as propulsive movements of the hands
7. Swimming two body lengths under water
8. Trapping air in clothing to increase buoyancy
9. Utilizing modified breaststroke with hands pressing downward as well as backward to provide additional support. (Note: In one elementary backstroke and breaststroke, a narrow version of the breaststroke kick and inverted breaststroke kick can be used when wearing light shoes or canvas sneakers. However, when wearing knee length boots the victim should immediately assume a prone position with the knees bent in order to trap air in the boots for additional support. Air can be trapped in hip boots by quickly assuming a back floating position with the knees pulled towards the chest. It is usually best to use only the arms for propulsion if the boots remain air filled.)
10. Wrist or collar pull to assist or tow a tired or exhausted swimmer. The wrist pull can be used to assist a tired swimmer who remains in a prone swimming position and continues to stroke with his free arm. In both instances, the rescuer may use a modified elementary backstroke kick of the legs with a shortened arm action, or if barefoot or wearing lightweight shoes, he may employ a scissors kick with the shallow arm pull.

It is generally best to stay with a small boat should it capsize or swamp. Most craft will remain at the surface even though filled with water and can be held onto or used as a life raft. When possible, capsized boats should be rolled over to an upright or swamped position to provide a water filled floating support for the crew to get into.

To prevent the craft from rolling over while being boarded, two should enter at the same time from opposite sides. Both persons reach over the gunwale and place their hands into the bilges or on the bottom to support their weight as they slide over the gunwale into the craft. Passengers should keep body weight as low as possible when entering the craft, and weight should be kept evenly distributed while seated. A swamped or capsized boat is more likely to be spotted by searchers than a swimmer, and the risk of drowning is greatly reduced by the person's staying with the boat. Leaving the boat may be necessary or advisable, however, when there is danger of fire or explosion, the boat is drifting into dangerous areas or sinking, or the water is extremely cold. Also, it may be best to swim for a point of safety if such a place is as near at hand as the craft. In all instances, if swimming is necessary, life jackets or other flotation gear should be used if available.

Responsibilities of the operator

The Coast Guard recreational boating reports indicate that approximately 55% of all boating accidents can be traced to negligence on the part of the operator, and that over 65% of the fatalities are caused by faulty judgment and operation. Improper loading, overloading, recklessness, disregard for weather and water conditions, and failure to seat passengers properly are operator practices that lead to the majority of boating accidents. The craft most often involved in accidents is the outboard powered boat. Canvas and rowboats constitute the second largest accident category, while sailboats and sailboat auxiliaries account for the least number of fatal accidents.

The relatively low fatality rate for sail craft — 3% of the total lost while making up over 7% of the recreational craft in use — is because most small boat sailors learn to sail under supervision and capsizing drills are an integral part of the training. In other words, small boat sailors expect an occasional dunking as part of the sport and are prepared to cope with the situation.

Basic training in safety and boat handling is available from organizations such as the United States Power Squadrons, Coast Guard Auxiliary, and American Red Cross chapters. Where courses are not offered, new boat owners should seek advice from experienced operators and/or marine dealers before attempting to navigate their craft by themselves. Without instruction a beginning boatman sometimes follows the often incorrect practices of others. The following are unsafe practices that frequently end in serious small boat mishaps:

1. Outboard and Inboard Power Boats
   - overloading and improper disposition of weight in the boat
   - high speed turns
   - sitting on gunwales and decks
   - standing and/or moving about when boat is under way
   - disregard of weather and water conditions
   - improper refueling procedures
   - failure to maintain lookout
   - failure to use lifesaving equipment when indicated
2. Canoes and Rowboats
   - improper loading and overloading
   - standing up
   - lack of boat and canoe handling skill
   - disregard of weather and water conditions
   - failure to use lifesaving equipment when indicated
3. Sailboats
   - disregard of weather and operating conditions
   - overloading
   - lack of operating experience
   - failure to use lifesaving equipment when indicated

An untrained boat operator may accumulate many hours of accident free experience and still lack the know-how to cope with an emergency. Responsible boat owners will take every opportunity to increase their knowledge and skill by study and training.

PROPER CRAFT AND EQUIPMENT

The proper selection of a craft provides the base for recreational boating safety. Obviously no single type of small boat can efficiently and safely function under all water and weather conditions, nor could one design adequately meet the many specialized requirements of the various boating activities. The evolutionary development of small water craft dates back to primitive man's first hollowed out log, and today there are four major types of recreational boats — rowing, paddling, sailing, and power. Thousands of different models of the four types have been designed and built for work and recreational purposes.

From the standpoint of safety, small boat selection should be based on the floating characteristics of the boat when capsized or filled with water. The craft should have sufficient buoyancy, or flotation, to remain in a horizontal, upright position and to support the weight of the motor, if any, and crew. Buoyancy compartments should be filled with expanded foam. Craft made of nonbuoyant material that has most of its flotation material in the bilges under the deck will float in the capsized position, offering little to hold onto. Also, they are difficult to roll over into a swamped position where they can be used as life rafts. The boatman should seek expert opinion and guidance from reliable marine dealers and local boating experts before making a purchase.

The following descriptions of basic types of small craft may be of help in the final selection of a suitable boat.

Rowing craft

Recreational rowing craft are comparatively light and are designed primarily for protected waters. This type of boat is constructed so that the greater part of the bulk is above the waterline; consequently, the load should be kept low and distributed to keep the boat properly trimmed.

Overloading and standing passengers are the major causes of rowboat accidents. Also, conventional rowboats equipped with powerful outboard motors can prove too difficult to handle and so cause accidents. Only low horsepower motors should be used.

The common types of rowing craft are the following:

Dory. Although the true fishing dories of New England and Canada are not used for recreational purposes, their basic design is often used for certain rowing craft. They are deep, narrow, flat-bottomed, keelless boats, with sides that flare out to a wide beam amidship. The narrow width at the waterline causes them to be unstable, but sufficient weight in the bottom can offset this. The length may be as much as 22 feet

Dory-skiff. Dory-skiffs are more shallow than the dories and have a wider bottom and transom. They combine some of the best features of the dory and the skiff and are often used in lifeguarding. Their maximum length is 18 feet.

Skiff. Skiff denotes the common square-stern rowboat: the bottom is flat, and the sides are either straight or slightly flared. This type of boat should be used only in protected waters. Definitions and classifications of skiffs vary greatly from region to region. Other names are "sharpies" and "flatties." The skiff is a utility boat, and is often used by fishermen. Its length varies from 8 to 18 feet.

Dinghy. Dinghies are short, heavy, round-bottomed craft and are frequently rigged for sail. They often serve as tenders for larger boats. The length is 7 to 12 feet.

Pram. Prams are flat or slightly V-bottomed boats with square ends. The transom bow is slightly more narrow than the transom stern. They are used for sailing and tenders. The length is 8 to 10 feet.

Punt. Punts, scows, or john boats are narrow, shallow flat-bottomed craft with identical square overhanging ends. The vertical sides give a box-like appearance to the boat. Punts are used in shallow water and are generally maneuvered by poling, although they may also be rigged for rowing.

Many fine rowing craft models of the past have become extinct, but there has been an increasing demand for good "pulling" boats which has stimulated interest in producing copies of the best known historical designs for recreational purposes.

Paddling craft

Canoes and kayaks are used more or less interchangeably in a variety of activities. Choice is primarily based upon initial cost, price of upkeep, and, of course, individual preference.

Canoe models, like most boat designs, are the result of compromises. A craft designed for carrying heavy loads will lack speed and maneuverability. If the canoe has to be carried at frequent intervals, lightweight construction is important. Length is often decisive if the canoe is to be used for recreational purposes.

The canoe models on the market are generally good, and the many types of construction materials allow the buyer to be selective in deciding which craft will best suit his purposes. However, the following design characteristics should be considered when selecting a paddling craft:

A 15 foot canoe is light (50 lb. to 65 lb.) and is therefore a popular choice among young paddlers. Also, it is relatively slow because of the beam-length ratio. Adults who are paddling alone often select it, however, for demonstration routines where responsiveness and a high degree of maneuverability are needed.

A 16 foot canoe is the most popular for general recreational use. It may be used for either single or two-man paddling and, under

Figure 1. A Red Cross small craft instructor teaches canoeing to college students in a canoeing class at Oregon State College, Corvallis.

normal conditions, can safely carry an extra adult passenger or duffel or equivalent weight.

A 17 foot and an 18 foot canoe are often used for extended cruising. The shorter craft will carry three adults or the equivalent weight in paddlers and duffel, while the longer craft will accommodate another passenger or additional gear.

A wide, flat-bottomed canoe is relatively stable If the full (broad) lines are carried well into the ends, additional stability and weight carrying capacity can be expected. The longer (17 and 18 foot) models are well suited for shoal or white water use and for cruising.

A canoe with full (stubby looking) ends will "lift" over waves and ship less water than a canoe with sharp ends.

A canoe with a rocker-like curve to its bottom or keel is more maneuverable than one with a straight bottom.

A round-bottomed canoe is usually narrower than a flat-bottomed craft and has less stability. However, it is generally faster and is easier to paddle from the center (single) paddling position.

A long canoe is faster than a shorter canoe of the same basic design.

A canoe with high ends and freeboard is affected more by crosswinds than one that has a lower profile.

A keelless canoe is more maneuverable than one with a keel and in white water is less likely to catch on shoal obstructions.

A shoe (flat) keel provides more protection to the bottom of a canoe than a narrow, deep one.

A canoe with hardwood gunwales and paddling thwarts instead of seats is preferred by experienced canoeists.

Sailing craft

Recreational sailing falls into three classifications: racing, cruising, and day sailing. Many types of boat hulls have been developed to meet the specific requirements of each category. The types can be broadly classified as (1) sailing prams and dinghies, (2) day sailers, (3) racing classes, (4) cruising classes, and (5) a special group consisting of board boats, canoes, and the multihulled catamarans and trimarans.

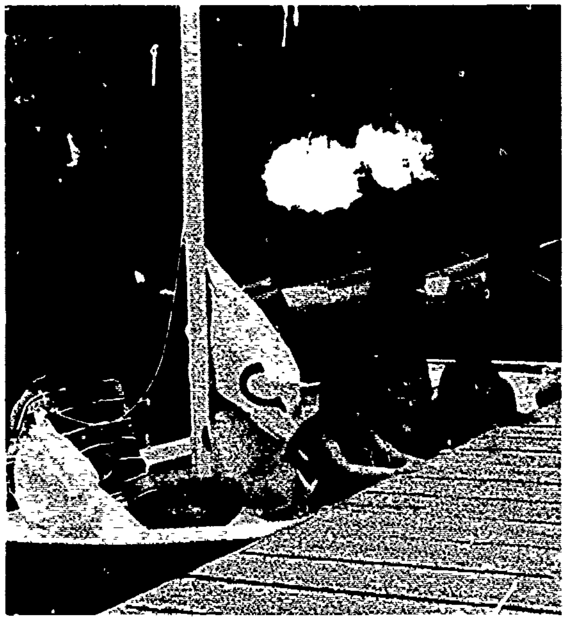

Figure 2. The use of lifesaving equipment keeps this group a happy family.

Although day sailers and cruising craft are often raced in competition with other boats of the same type, or under a time handicap, the day sailer is essentially a family boat designed for a safe, comfortable day afloat, whereas a cruising boat is built for sailing in comfort and safety for extended periods of time. The racing craft, on the other hand, is a highly efficient machine that is rigged, tuned, and sailed to cover distance in the shortest possible time.

The prospective purchaser of a sailboat should carefully analyze his needs and the sailing conditions in his area. He should seek advice, unless he has had considerable sailing experience, before deciding on a particular model. Because of the conflicting requirements of safety, speed, comfort, and ease of handling, as well as cost and maintenance, hundreds of different models have been designed and marketed. Only an experienced or well advised sailor could make a suitable selection for his particular needs.

Power craft

There are two basic hull designs for power craft: (1) the displacement type which plows through the water and (2) the planing hull which skims on the surface. The choice of the power system for each type can hinge upon individual preference, cost, or the purpose for which the boat will be used.

The displacement boat displaces a volume of water equal to the total or gross weight of the boat. The bottom may be flat, V-shaped, or round; however, characteristically, the boats have a pointed or tapering aftersection or stern and have their widest beam at or near amidship. Rowing craft, canoes, and most sailboats and deep-water boats have displacement hulls. They are seaworthy when handled properly under conditions for which they were designed. Their speed, however, is limited by their waterline length and by the contour of the hull. The volume of water that is displaced by the sharply pointed bow when the boat is under way must, by its own weight, flow in and refill the space vacated by the moving boat. Should the boat move faster than the displaced water returning to fill the void, the stern squats, and a powerful effect is produced on the aftersection of the hull. Therefore, boats with a long waterline that gradually tapers toward the stern are faster than shorter craft of the same design, since the slower return flow of the displaced water produces less suction or drag on the longer boats. *Attempting to force the boat to a higher speed by increasing power not only creates more drag but dangerously affects the handling characteristics of the craft.*

The planing hull also displaces a volume of water equal to its gross weight when it is motionless or moving slowly through the water. However, when its movement is accelerated, water pressure builds up on the broad undersections of the bottom and lifts the boat to the surface.

Conventional planing hulls are fast and highly maneuverable but are likely to be hard riding in a "chop" when operated at high speeds. Pounding often becomes severe and damaging in rough water unless the speed is reduced to displacement speed. Outboard planing hulls with flat underwater sections and broad transoms are not as seaworthy as displacement boats of similar size, and their use should be restricted to relatively smooth waters and protected areas.

The shape of the forward sections ranges from the flat, needle pointed outboard hull to the round-bottomed and V-bottomed types.

The flat-bottomed craft are fast but dangerous and very hard riding in rough water. A fin or a skeg provides some directional stability and resistance to skidding in turning maneuvers. Single suspension planing boats, which skim on the water with only a small wetted area of the aftersection in contact with the surface, rapidly lose stability as speed is increased and the supporting surface becomes smaller. The decrease in stability can lead to loss of control and capsizing, especially in high speed turns. Flat-bottomed boats with their sharp chines are particularly vulnerable to tripping in sharp turns.

The V-bottomed boats generally flatten out to a broad aftersection. They have better directional stability and give a softer ride but are slower than flat-bottomed boats of comparable size. The shape of the bow section may range from a shallow, flared V to a deep V. The speed potential decreases with the depth of the V section, but seaworthiness and riding qualities improve.

Round-bottomed boats are smoother riding but slower than V-bottomed or flat-bottomed craft. They require more power to reach and remain on a plane, but they bank better in turns, presenting less danger of flipping. Models with a more rounded bottom will lack the initial stability of the V-bottomed and flat-bottomed types, and require that the weight aboard be placed toward the center and as low as possible.

Required equipment

Equipment requirements for motorized craft are established by federal and state laws. An increasing number of states also requires certain gear such as lifesaving devices for the occupants of rowboats, canoes, and small sailboats. In addition to Coast Guard approved lifesaving devices for powerboats, other required items include approved backfire flame arresters for each carburetor, fire extinguishers, whistle, bell, and ventilation systems.

Equipment requirements vary according to types and classes of boats. In particular, the regulations governing each category of small craft should be checked and rigidly observed. Moreover, while the regulations establish only minimum equipment requirements, other gear should be carried for emergency purposes. The selection of additional equipment should be made on the basis of type of craft, the extent of operation, and the nature of wind and water conditions normally encountered. Recommended items include oars and paddles for craft that can be manually propelled, anchor and line, bailing device, fire extinguishers, compass, radio, charts, distress signals, first aid kit, flashlight, extra line, tools and spare parts for the motor if one is carried. All craft operating after sundown must carry lights as required by law. Since the lighting requirements are not the same for all types of boats, and vary from area to area, Coast Guard regulations should be checked.

ENVIRONMENTAL CONSIDERATIONS

The activities of boating people are regulated by the forces of nature. The experienced boatman develops a healthy respect for weather conditions and is constantly alert to changes in temperature, wind direction, cloud formation, and barometric pressure, which may indicate the approach of bad weather.

Weather predictions

Weather predictions based on observation are of most value in forecasting localized weather phenomena such as thunderstorms. For long-range weather predictions, the official Weather Bureau forecasts give the most reliable information. Long-range predictions are published in the daily papers and are broadcast on radio and TV stations, and should be checked carefully before starting an outing on the water.

The weather forecast reports predict changes in temperature, humidity, precipitation, visibility, and wind velocity. Of greatest concern to boatmen from a safety standpoint are wind velocity and, to a lesser degree, visibility. Large weather systems that produce high wind velocities are carefully plotted and forecast sufficiently in advance to make necessary preparations.

Thunderstorms

Localized thunderstorms are generally the most dangerous weather menace to small craft. A constant watch should be maintained for cloud formations with dark bases whenever they are predicted for the area. They may form quickly and can develop squalls with wind velocities of 50 miles per hour or more. Fortunately, they are slow moving and small in size — about 1 to 10 miles in diameter — and do not last long. The alert and cautious observer seeks shelter long before the dangerous "sudden" storms strike.

Thunderstorms also develop along the advancing front of a cold air mass when it meets warm, humid air. They may extend in a line of several hundred miles, and small craft should remain in port until they have passed. Transistor radios can be carried aboard the smallest boats; to persons afloat, they offer the best means of keeping posted on weather conditions. They may also warn of thunderstorms in the vicinity by emitting static noises.

Lightning is an added danger to craft during thunderstorms. If the path of the storm cannot be avoided, every effort should be made to get the craft as close to shore as possible where objects at a higher elevation, such as trees, are more likely to be hit by the electrical discharge. If the craft is caught in open water in advance of or during a thunderstorm, occupants should keep as low in the boat as possible and not use fishing poles or other gear that may extend upward.

Safety procedures

Small boats should seek shelter at the first sign of threatening weather, since these boats are difficult to handle under strong wind and water conditions. An overpowered or mishandled boat in rough weather can be capsized or swamped and, as stresses are increased, there is danger of a rigging or structural failure. When the small craft faces deteriorating weather conditions, precautionary measures should be taken to reduce the risk of capsizing or swamping. Canoes and rowboats should avoid exposed areas on large bodies of water and follow the protected waters along the windward shorelines of lakes and rivers. During bad weather, all weight should be kept as low as possible and concentrated amidship to allow the ends to lift more readily to oncoming waves. Any water taken aboard should be bailed out immediately. Even a few gallons sloshing about from side to side will seriously affect the trim and stability of the craft.

Keep the craft directly before the waves when the destination is downwind. Use the paddles or oars to stay on course, with the wind supplying most of the propulsion.

Make the approach to a lee shore on large bodies of water very carefully, since surf conditions are difficult to judge from offshore. If the breakers are high, go overboard and hold onto the stern to prevent the craft from broaching. Avoid getting between the craft and beach when in the breaker line.

When the course is at or near a right angle to the wind and waves, the canoe or rowboat can be expected to make considerable leeway unless headed slightly into the wind. The angle will be determined by the force of the wind and the height of the waves. In high winds, when forward progress through the water is difficult, paddle or row to prevent making sternway and allow the force of the wind to "slide" the craft toward its objective. Establish a range on shore to help stay on course. When a course is directly to windward and headway is impossible, try tacking back and forth to reach the objective.

In extreme conditions, when progress is no longer possible, anchor the craft or improvise a drogue with a paddle or oar and a long-sleeved shirt, coat, or jacket. Thread the oar through the sleeves and attach a short bridle over the cuffs. Secure the bowline to the center of the bridle. To improve the effectiveness of the drogue, button the lower buttons and tie the shirttails with a light line to form a bag. When using the drogue, keep the back of the garment toward the surface. Sit or lie in the bottom of the craft to lower the center of gravity and reduce windage.

In bad weather power craft should operate at reduced speeds to reduce pounding and to insure better control of the boat. Life jackets should be worn and passenger weight kept low in the boat, and the bilges free of water. If the course is to windward, high waves should be approached at a slight angle instead of head on. With a canoe or rowboat, it may be necessary to tack to windward in heavy going.

Courses at right angles to wind and waves can be made without danger, unless the waves are cresting and breaking. Because of its maneuverability and speed, an outboard can avoid waves that are about to break if the skipper is alert and skillful.

Regardless of the hull design, there is always danger of water coming in over the transom when a power craft is running before the wind and waves. All outboard boats should have a watertight bulkhead across the boat immediately in front of the motor. Some outboards have a transom height of 20 inches and use a long shaft motor, but most outboards have a transom of only 15 inches. This height is further reduced by the weight of the motor and in following seas it may not be sufficient to prevent taking water aboard. Speed should be adjusted so that the boat stays ahead of peaking and breaking waves, but it should not be so fast as to create a danger of burying the bow in the wave ahead.

Under extreme wind and wave conditions, it may be impossible to make headway and keep the boat under control. In such cases, the boat should be anchored with as much scope as possible or a drogue put out to hold the bow into the wind.

Sailing craft should heed the following precautions if heavy weather conditions develop:

1. When close reaching or beating to a point of safety —
   Move crew weight to windward.
   Keep an eye to windward for signs (catspaws) of increased wind strength.
   Luff the boat, or ease the sheets in the stronger puffs to reduce wind pressure on the sails. It is important to keep the boat moving, otherwise rudder control will be lost.
   Put on life preservers.
   Keep the bilges dry. Water in the bilge will decrease stability.
   Lower the jib.
   Under extreme conditions, lower the mainsail and anchor, if possible.
   Keep all weight low in the boat near or aft of amidship so that the bow can lift with the waves.
   Put out a drag, or drogue, if it is not possible to anchor.
   The sails can be bundled and tied to a line from the bow to reduce leeward drift.

2. When reaching to a point of safety, as when on the wind —
   Keep weight to windward, bilges dry, life preservers on, and the boat moving.
   Ease the main sheet in the stronger puffs.
   Sheet the jib in tightly to back-wind the mainsail and reduce its drive. Also, raise the centerboard slightly if there is an excessive weather helm that may cause damage to the rudder assembly.
   Head the boat upwind of the objective to compensate for drift and to avoid taking the larger waves broadside.
   Drop and secure the mainsail. Most sloops can reach under the jib alone.
   Drop all sails and anchor or put out a drogue under extreme conditions as when on the wind.

3. When broad reaching or running to a point of safety —
   The boat is generally in a safer sailing position when reaching or running than when on the wind. Chief dangers are in broaching or turning broadside to wind and waves and in surfing down the face of a wave and burying the bow under the wave ahead. True wind velocity is deceptive while running, since the apparent wind is reduced by the speed of the boat. Consequently, high waves may develop before the true force of the wind is realized. Proceed as follows —
   Raise the centerboard to reduce the danger of broaching.
   Flatten the jib.
   On a broad reach, ease the main sheet until the boom is almost touching the shrouds. On a run, haul in the main to reduce wind pressure. The boat must be held directly before the wind to avoid sailing by the lee and the danger of an accidental jibe.
   Lower the main and sail by jib alone. This action can be taken while running if rudder control is good. Hold the boat directly before the wind and sheet the main in until the boom is near the center of the transom. Because of pressure on the sail, it may be necessary to haul the sail down by the bolt rope as the halyard is eased off.
   Flatten the jib and trail a line or drogue over the stern to reduce speed.
   Lower the jib and sail under bare poles.
   Anchor or ride to a drogue attached to the bow.

When it is necessary to ride out a blow, avoid a lee shore and try to work the boat to the leeward side of a headland or island where it may be possible to anchor in comparative shelter.

Water Skiing | ROLAND JAMES GEORGE

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Water skiing is one of the simplest outdoor sports. This is evidenced by the many successful beginners who have never before participated in athletics. Water skiing can be as easy and as much fun as it looks. As in bicycle riding, getting started is the most difficult step. Water skiing is basically safe; the degree of safety depends upon the precautions and care taken by its participants.

ACCIDENTS

Annual surveys of the Outboard Boating Club of America and the American Water Ski Association show conclusively that even though an estimated 500,000 pairs of water skis are sold annually in the United States, accidents and fatalities are infrequent. While water skiing has become the third major incentive for people to buy boats, serious or fatal accidents on skis represent a small percentage of boating accidents.

The vast majority of accidents in water skiing involves either the amateur or the reckless fringe of the sport. This includes the untrained boat driver, the novice skier, and the poor swimmer. Accidents also occur when the activity is unsupervised. Most intensive skiing is done by organized ski clubs, commercial ski schools, ski shows, and competitive tournaments. The incidence of accidents in these organized segments of the sport is extremely low. During the 20 years that the American Water Ski Association has been sponsoring water ski tournaments, there has never been a fatality in any of its sanctioned events. Many commercial ski schools have operated for 10 or 12 years without a serious accident or fatality. This record has been maintained in areas where skiing goes on steadily for as many as 8 to 10 hours daily.

Basically, there are five elements of safety consciousness in water skiing: (1) the skier, (2) the skiing gear, (3) the boat driver, (4) the boat and motor, and (5) the water.

Hazards caused by the skier

Water skiing accidents are invariably caused by errors either on the part of the skier or the boat driver. There are the problems of not wearing a life belt or jacket, not having an observer in the towboat, not learning the skier-driver signals, or not releasing the towline after falling. Falling may be fun for the adventurous student, but the time it takes to pick him up cuts down on instruction time. Falls are rarely dangerous and are more frequently caused by unexpected rough water or by the misjudgment of the instructor or boat driver than by the skier. In falling, a skier is less likely to be injured from hitting the water than from hitting docks, piers, pilings, sea walls, and boats. In salt water areas, oyster bars, barnacle encrusted walls, and pilings can cause serious injuries. Skiing in shallow water is hazardous because the skis hit bottom and throw the skier forward, resulting in sand and grass burns, rock scratches, or fractures. The minimum depth for safe skiing is four feet for children and five feet for adults.

Skiing at night is unwise and several states forbid it. Exceptions to night skiing include ski shows or exhibitions, ski schools, and organized water activities with adequate lighting and the skier's use of luminous bathing caps, gloves, and ski tips.

It is unsafe for two people to ski together with ropes of different lengths. If the skier on the long rope falls, the rope can easily wrap around and entangle the skier on the short towline. It is difficult to avoid the dragging and whipping rope or the spray thrown by the handle dragging in the water. Another hazard is fatigue; a tired skier not only ceases to learn, but becomes a hazard to himself and others. In landing, a skier should run parallel to the shore rather than straight into it. Before skiing, one should check the steering cables, towropes for worn and frayed spots, loose runners, wing nuts, binder slivers, and any sharp protruding objects on the skis. In jumping, a single handle should be used. Double handles are dangerous in a fall because they may wrap around the skier's body. Burns can result from not releasing the rope after falling.

The greatest hazard in ski racing is falling — it can cause broken ankles, shoulders, and collar bones. Falling is usually caused by the bindings, called "beartraps," which hold the skier's feet solid. The foot must be "jerked" out. Speed skiers must lean well back on their skis to prevent the tip of their skis from digging into the water.

Hazards caused by the boat driver

A common hazard caused by boat drivers is "hitting it" before the towrope is taut, before the skier's tips are visible, and before the skier has indicated readiness. The driver should steer away from objects, such as piers, docks, pilings, sea walls, and other boats. Additional hazards caused by the driver include not cutting the speed of the boat when the skier falls or climbs aboard the boat and following another boat too closely — 200 feet is a safe distance. Accidents are also caused when the driver or observer rides on the gunwale or on the back of the seat, jumps from a moving boat, or boards an outboard motor boat from the stern.

Removal of hazards

When the skier falls, the observer should give instant notice to the boat driver who, in turn, should reduce speed immediately and determine if the skier is entangled in the towline. After a skier falls, he should clasp both hands overhead to signal that he is all right or hold up a ski so that other boat drivers can see him. With an OK signal from the skier, the driver should proceed toward the skier at a reduced speed. This will allow time for the skier to put on his skis, the observer to coil the rope, and the driver to circle accordingly. The driver should approach the skier from the downwind (i.e., leeward) side so that the boat will not drift over the skier. The motor should always be in neutral when passing near the skier. However, an idling motor is not always safe since the propeller may still be turning and thus cut the skier. After the fallen skier has grasped the rope and handle, the driver should continue forward at idling speed until the towline is tight. The driver should then check the lake traffic and proceed accordingly. Boats can be equipped with a safety throttle that automatically returns the motor to idling speed when pressure is released. To prevent hitting a dock, pier, or piling when landing, the skier should sit down on the skis and drag his hands in the water. In heading directly toward shore, the skier should crouch slightly as the tow handle is released and, judging the speed accordingly, sink into waist deep water. Skiers should look ahead and know where they are going at all times.

Conditioning

Skiers sho' 'd develop their muscles with barbells and isometric exercises. Quarter squats and thigh extensions will strengthen the knees to the fullest extent. "Sitting pulley rows" and the "two-hand bar bell curl" are used mainly for increasing bicep strength and building power in the upper arms. Sit-ups will build abdominal strength. Other exercises will help to strengthen the wrist, arm, and back.

FACILITIES AND EQUIPMENT

It is important that a proper combination boat and motor be used for skiing. An average, well performing ski boat is 14 feet long, with a 50 to 70 inch beam, equipped with a 25 to 40 horsepower outboard motor. This combination is the recommended minimum requirement to pull one skier with a driver and observer. It is especially important that the ski boat have a wide beam for safety and stability against the pull of a skier cutting sharply to the side of the boat. For more versatility, a 15 to 17 foot boat with a proportionately wider beam, powered by a 50 to 100 horsepower motor, will pull two or three skiers. Inboard boats, which also perform well for skiing, should be 15 to 18 feet long with a 90 to 210 horsepower engine. In general, an inboard requires a larger maneuvering area than an outboard combination. A driver should never attempt to pull a skier with a boat lacking a steering wheel. A good ski boat need not be extremely fast. A good speed for beginners is 18 mph. and as they improve the speed can be increased to 22 mph, to 27 mph. For safety, the maximum speed of a boat should be between 30 mph. and 35 mph. A good planing hull of semi-V construction is also recommended.

Boats should be equipped with a minimum of two paddles; small anchor; extra line and motor parts; horn or whistle; speedometer or tachometer (engine revolutions per minute); tool kit; lifesaving equipment; fire extinguisher (if the boat has any enclosed spaces); boarding ladder; rearview mirror; sufficient life jackets and/or cushions for the driver, observer, skier, and any passengers; running lights; steering wheel; first aid kit; extra gas supply; and registration numbers. However, when a boat is used expressly for skiing, all chrome and other fixtures projecting from the sides and top, such as flag standards, lights, and cleats which may snag the rope and rip out of the wood when they become entangled with the rope, should be removed. Windshields are optional.

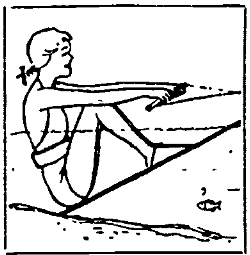
The ski tow hitch should be sturdy and well constructed. It can be a center mounted pylon; a transom mounted hitch, which also carries the rope out of the water for easier visibility; or a rope yoke attached to the tow eyes on the transom of the boat. A rope yoke should be equipped with a free riding swivel to which the towline is attached. The swivel distributes the pull of the skier equally on both sides of the transom and makes driving safer and easier. A safe way to attach a towline is to install eye bolts in the transom of the boat. Life handles on the boat or motor clamps should not be used as substitutes. Electric ski rope retrievers play line out automatically so that if a skier falls, a touch of a button, operated in the boat, retrieves the rope. A hitch should be designed to hold the rope away from the motor. Some hitches hold the rope above the motor to prevent its dipping into the water and becoming fouled in the propeller. Many hitches attach to the transom, while others are installed inside the boat, forward of the motor.

For water skiing, a low freeboard is recommended to provide easy boarding for the skier in the water and reduce weather vaning or wind drift while standing still. High freeboards are

NATIONAL WATER SKI ASSOCIATION, INC.

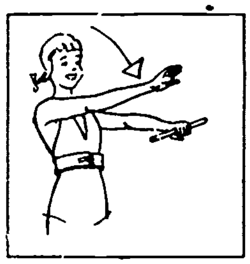
SKIERS' SIGNALS

START
Shout "HIT IT" or nod head.



FASTER
Palm up – motion upwards, or nod head if both hands are in use.

SLOWER
Palm down – motion downward, or shake head if both hands are in use.



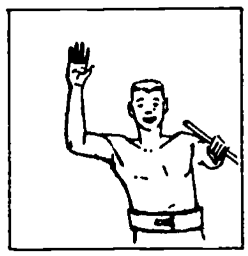
SPEED OKAY
The okay signal, with thumb and forefinger making a "O." No motion of head if both hands are in use.

TURN
Palm vertical, describe curving motion with hand in direction desired.

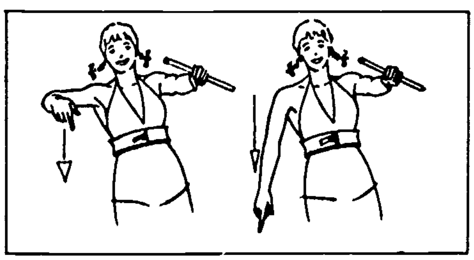
WHIP OFF
Point to direction and then give quick circular motions with hand.

JUMP
Raise hand sharply imitating jumping arc

STOP
Hand up, fingers outstretched -- policeman style.



BACK TO DOCK
With bent elbow, point forefinger downward, Still pointing, extend arm downward sharply.



CUT MOTOR
Draw finger across windpipe in cutting motion.

While on land the Ski Instructor should demonstrate all Skiers' Signals as part of his "Dry Land Instruction". To pass the Intermediate rating of the National Water Ski Association, campers must be able to demonstrate on land all ten of the Skiers' Signals; therefore, signals should be used while riding whenever appropriate. These ten signals seem to be commonly accepted and universally used; however, Ski Instructors can develop additional signals as they see fit.

designed more for heavy seas and open water where skiing is rarely done. Hardware and its attachments, such as fins, foot binders, screws, and nuts, should be as simple as possible and free of sharp protruding surfaces that could scrape or cut the skin. Ski lines and handles should likewise be free of complicated hooks and eyes as well as unnecessary loops that might entangle, catch, or cut the skier.

Ordinarily, lines are made of 1/4 inch twisted Manila hemp or braided 1/4 inch polyethylene or linen. The three most widely used handles are the single bar, the trick bar, and the slalom of double handles. The single bar is a wooden handle 1 1/4 inch thick and 12 inches long which is used for all conventional skiing, doubles, and jumps. The trick bar is also 1 1/4 inch in diameter, but is longer than the single bar. Most skiers prefer a trick bar 18 inches long.

There are three main types of throttles on boats: the pivot, the foot, and the hand throttle. The hand throttle is best suited for the skiing boat. Water skiing is still a new sport, and the design of skis and other equipment is constantly being improved. All skis have fins or skegs, except turnaround or trick skis. The bindings of skis are made of soft rubber or plastic. Wood is the best material for skis, although fiberglass has recently been used with some success.

The specifications of the American Water Ski Association state that skis should be not less than four feet long nor more than eight inches wide. There should be a rack for the skis out of the sun, a place to dry the two ropes, a rack for the life belts, and a fuel supply.

CONCLUSION

Many states lack legislative provisions dealing with reckless and negligent behavior in water skiing and boating. While legislators have attempted to enact laws that would make these activities as safe as possible, the proposals frequently have been restrictive and impractical. In 1967, the National Association of State Boating Law Administrators (NASBLA) adopted a draft of the Model Boating Act which contains clauses that prohibit participating in skiing, surfing, boating, and aquaplaning while displaying reckless or negligent behavior or while under the influence of liquor or drugs.

In addition, the Model Act calls for the inauguration of a comprehensive boating safety education program and provides that state agencies may issue certificates to persons who complete the program. The action of the NASBLA is an important step in the establishment of uniform boating laws. It also arms state administrators with information on which to base recommendations to legislative committees considering boating regulations. No rule book or statute can replace common sense. Be he a novice or tournament champion, a water skier must first and always use good judgment.

References

Brentz, Leo. How to put method in a water ski school. *The Water Skier** 16:20-26, no. 13, June-July 1966.

Christensen, Al. Developing muscles for water skiing. *The Water Skier* 17:18-19, no. 1, Febr.-March 1967.

Clifford, William D. A safety lesson that never grows old. *The Water Skier* 17:42-44, no. 5, Aug.-Sept. 1967.

Model Boating Act wins approval. *The Water Skier* 17: 23-24, no. 7, Dec.-Jan. 1968.

Prince, Walter N. *Water Skiing for All.* 2d ed. Philadelphia: Chilton Book Co., 1956.

* *The Water Skier*
American Water Ski Association
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Winter Haven, Fla. 33880

Skin and Scuba Diving | BERNARD E. EMPLETON, M.S.

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It is estimated that some two million scuba divers venture underwater in the United States. The number of skin divers is considered to be many times this number.

Agencies devoted to providing training for these submarine adventurers are few. This obviously means that a great number of Americans are risking their lives because of inadequate training. Diving fatalities increase with the mounting sale of equipment. National organizations such as the YMCA, Red Cross, Boy Scouts, and Underwater Society of America have developed instruction programs. The Council for National Cooperation in Aquatics, which represents the above mentioned organizations in addition to two dozen other national organizations, has devoted considerable time to the problems of safety in skin and scuba diving. The best resources of the country have met under the auspices of CNCA for the past 15 years to work for the safety of the underwater venturer.

A natural beginning for instruction is in the schools. What better approach is there for the young person than to learn at school in a fine combination of physical education and physics what diving is all about? There needs to be a healthy respect engendered for a sport that, while comparatively easy to learn in terms of fundamentals, is fraught with hazard to the uninitiated.

SKIN DIVING

Skin diving is a term often used erroneously when one really means scuba diving. Skin diving refers to diving with fins, faceplate, and snorkel while scuba (self-contained underwater breathing apparatus) diving refers to diving with a tank or tanks of compressed air on one's back.

In skin diving one is able to stay under water for as long as he can hold his breath. In scuba diving the air which is carried in tanks enables the diver to stay under water for a prolonged time, depending upon the amount of air carried, the depth to which the diver goes, and his work load.

While diving is great fun it is not without hazard. Even skin diving, while not subject to the same accident potential as scuba diving, does have its record of fatalities. There is no substitute for knowledge and training. Without this as a beginning step, the sportsman risks everything for want of the relatively little time it might take to orient himself properly.

Equipment

Basic skin diving equipment consists of a faceplate, snorkel, and fins. The faceplate should be a good fit of soft rubber or neoprene so that no water leaks into the air spaces. The plate should be made of safety glass, not plastic. The more snug the fit the easier to use and to clear if it should accidentally fill with water.

The snorkel is a "J"-shaped tube usually of rubber or neoprene with a soft mouthpiece of rubber. Its purpose is to enable the diver to swim on the surface by breathing through his mouth into the snorkel, which protrudes above the water's surface.

Since the head is relatively heavy — between 19 and 23 pounds — a snorkel is a great help in staving off fatigue while simultaneously providing the diver an opportunity to look below and to breath freely. As soon as the diver descends, the snorkel fills with water up to the small air space in the hook of the "J." When the diver surfaces he exhales with a short, sharp breath which shoots the water from the snorkel and permits surface air to enter again.

At first, one may experience a psychological problem in using the snorkel but practice and experience usually eliminate initial fear and greatly add to the diver's pleasure and convenience. The length of the snorkel rarely exceeds 12 inches. One simply cannot inhale through a long tube. Beware of two and three foot snorkels; they are distinct hazards.

Fins vary in type and size. One should seek a pair that fits comfortably, is not too large, moves easily, and is of good quality.

The three pieces of equipment just described can unlock a veritable treasure chest of enjoyment. It is of principal importance, however, that the diver learn to use them well before he ventures into deep water areas either fresh or salt. A very basic skill is to fill one's mask underwater and learn to expel the air by holding one side of the mask firmly to the face and with a strong exhalation displace the water in the mask with air.

The most common kick is the easy, efficient flutter kick. The dolphin kick is also efficient but not as simple or useful as the flutter kick. Since man's progress underwater with fins is about a knot per hour one should not attempt to hurry. The conservation of the held breath is far more effective with a relaxed, easy approach to skin diving. After adequate adjustment one discovers increasing efficiency below. Proper training and the release of psychological inhibitions permit the full use of the individual potential.

Wet suit. In cold climates or where the water is cold, even in temperate zones, a protective suit should be worn. The most common type in current use is the wet suit, which is made of neoprene anywhere from one-eighth to three-sixteenths, or a quarter of an inch thick. Thousands of tiny cells add a great deal of buoyancy to the suit. The water gets into the cells and is heated by the body. The loss of heat from one's body is considerably lessened by such a device. Yet even the best suit will yield to long sessions in very cold water.

Dry suit. This device is designed to prevent any water from entering the suit and contacting the diver. The diver wears a layer of protective underclothing under the dry suit. In exceedingly cold water, ers may wear a wet suit and over it a dry suit.

Since the trapped air in a protective suit makes it virtually impossible to submerge, one must use lead weights which are threaded onto a web belt. The weights come in sizes which make it convenient to get all one requires on one belt. The idea is to get close to neutral buoyancy so that little effort is required to go either up or down.

In the early days of the diving craze and before the advent of simple, quick release buckles one was well-advised to fasten his belt with a safety hookup. When it is imperative to release the weight belt, one can ill afford to struggle to unfasten a knotted belt or undo a rig that lacks the element of quick release. The lore of diving has many casualties to show for failure in this important department.

Breathholding

Since the skin diver is dependent on his ability to hold his breath he is tempted to try to improve himself in this skill. Up to a point this is fine; if carried too far, this skill can prove fatal. Our need to breathe is signaled to us by the buildup of carbon dioxide in the body. Practice and will power enable the diver to override this signal of nature's. If he manages to stay down for progressively longer periods, the carbon dioxide buildup in the system becomes intolerable. When that occurs and nature insists that the time has come, the diver may black out and while unconscious and underwater, inhale. The result can be catastrophic unless a buddy is handy and a very prompt rescue program is undertaken.

One should know his limitations and not push beyond a reasonable point of endurance. It is for this reason that the underwater endurance swim, popular during the early part of this century, has long been discontinued.

SCUBA DIVING

Self-contained underwater breathing apparatus was introduced into the sporting world during World War II. There are three types of scuba diving: closed circuit scuba and semiclosed-circuit scuba, which are of restricted use for military or highly specialized professional occupations, and open circuit scuba, which is the popular diving sport. Whereas in closed and semiclosed circuit scuba the breathing medium is recirculated for rebreathing purposes, in open circuit scuba the breathing air is exhaled into the water and not reused.

The most common type of scuba used today is the single hose design. There are. however, many two hose regulators in use and one should know how to use them, as well as the full face mask design. The latter has special preference by those who have dental plate problems.

All open circuit scuba are somewhat alike. They consist of a high pressure air cylinder, a valve on the cylinder, a harness, and a valve for exerting control over the high pressure air coming from the cylinder to the diver. They utilize a mask or mouthpiece for inhalation and a valve for exhalation.

The detailed operation of scuba gear will not be treated here; the topic is adequately covered in *The New Science of Skin and Scuba Diving.*[1]

What we will consider, however, are some of the problems and dangers to be aware of as well as the overriding importance of full, adequate training.

As soon as man takes a supply of air with him to depths he takes also the problems inherent in the gas laws of nature. Diving involves heavy exertion. Sooner or later the diver will find his strength and endurance heavily taxed. The finest breathing apparatus still requires more than usual effort to breath. This added to the exertion increases the diver's load. Lifting and carrying the equipment, which can be heavy, demand a quality of fitness hat enables one to cope with emergency situations. A sound cardiovascular respiratory system is a must. If the individual is sound but relatively unfit he should improve his physical condition by endurance swimming and running.

A requirement for a diver is the ability of the middle ear and sinuses to take the pressure equalization changes required. *Gas Law:* Very simply, when a diver descends to depths with a cylinder of air fastened to his back, as the air in his lungs is compressed by the pressures at depth, he inhales from his tank to fill his lungs to their usual capacity. As he ascends he must continue to inhale and exhale to prevent his lungs from overexpanding and bursting. If a diver is 66 feet underwater and attempts to surface without releasing any of the air he has

[1] National Aquatics Association, *The New Science of Skin and Scuba Diving* (New York: Association Press, 1968).

taken in at that depth, the one lungful at 66 feet will equal three lungsful of air at surface.

If the pressure in the lungs causes a break in the lining and air bubbles enter the bloodstream, they may cause an embolism in the blood vessels, which prevents the blood from circulating. The result can be serious impairment or death.

Pressure acts on the air spaces in the body, such as in the ears, sinuses, lungs, stomach, and intestines as well as air space in a mask or suit. The failure of body air spaces to equalize under pressure can result in injury, such as a broken eardrum.

Rupture of the eardrum in cold water can cause a sharp upset in the balance mechanism. Until the water warms up the person will experience marked dizziness and nausea. Attempts to surface may end in going the wrong way. It is best to just hang on and wait for the sensation to pass unless, of course, a buddy is on the spot to assist.

Mask squeeze occurs when on descent the mask sucks to the face and increases the pressure unless one admits air into the mask. If a diver is wearing goggles he has no way of diminishing the squeeze and the blood vessels in the eyes and soft membranes suffer. For this reason goggles are only useful in very shallow diving.

One can also have suit squeeze when wearing a dry rubber suit. The folds of the suit can press around the skin causing ridges and uncomfortable pinching. The remedy is to introduce just enough air into the suit to allow the spaces to return to normal size.

Underwater body malfunctions

Air embolism. Air embolism is second only to drowning as a cause of scuba fatalities. A person suffering from air embolism (i.e., a bubble in the vascular system preventing blood circulation) may be unconscious before reaching the surface. Or he may seem normal enough upon reaching sea level only to collapse, lose consciousness, turn blue, or froth blood at the mouth. The severity depends on the extent of the lung blowout damage. The treatment is prompt recompression. This may not be readily available and even if it is it may not guarantee recovery.

First aid involves artificial respiration if the victim has stopped breathing. Sometimes lowering the head or rocking between the horizontal and head down position may relieve the embolism. Other results of lung damage are chest pain, difficulty with breathing and swallowing, shock, and *mediastinal emphysema* (i.e., air is forced into the middle chest tissue spaces). The treatment in serious cases is recompression. Rest and general medical care is prescribed for milder cases.

Subcutaneous emphysema. This is air in the region of the neck under the skin. It is not particularly serious though it may interfere with talking, swallowing, or breathing.

Pneumothorax. This is air in the space between the lungs and the lining of the chest wall. It may cause a partial collapsing of the lung affected and interfere with breathing. If there is a great buildup of pressure in the pneumothorax the lung may be completely collapsed and affect breathing and heart action.

The treatment is recompression for temporary relief. However, frequently the pressure needs to be relieved by the insertion of a needle. A medical person will be required for this.

Prevention of lung accidents. The best way is to understand thoroughly the operation of scuba and the effect of the gas laws. In ascent one should always breath regularly to keep the air passages open. When forced to leave the scuba behind or during emergency ascent the diver must exhale all the way up. Since this is contrary to his natural instinct he must learn these procedures by constant practice. A cool head is the answer in such situations and previous experience in free ascent is invaluable.

Before diving and as a matter of safety be sure you know where the nearest manned recompression chamber is located. Know how you will reach it if circumstances require.

Carbon monoxide poisoning. This can result from contamination of the air used in filling scuba tanks. One of the most common problems is engine exhaust gas finding its way into the air intake of the compressor. One should be sure of his air sources.

Nitrogen narcosis. It is caused by the high partial pressure of nitrogen at depth. The result is similar to drinking to excess. There is an anaesthetic effect. The diver becomes irresponsible and a hazard to himself. It is recommended that sports divers limit their dives to no more than 130 feet.

Decompression sickness. When the diver is exposed to an increased partial pressure of any gas, large amounts of gas will enter the diver's blood and tissues. When the diver ascends, the pressure is reduced and the gas tends to form bubbles. If the body tolerance is exceeded and the bubbles get into the joints, there may be a great deal of pain, a rash, or mottling of the skin. Commonly known as the *bends*, decompression sickness must be treated by decompressing the diver. The standard Navy diving tables should be consulted to avoid decompression sickness. There are "No Decompression" limits which permit a diver to dive without resorting to decompression. Learning how to use these tables is a must for any diver.

Additional symptoms of decompression sicknees are: dizziness, weakness or paralysis anywhere in body, numbness, loss of consciousness, vision impairment up to blindness, ringing in the ears, and convulsions. Since a bend can lead to permanent injury, treatment should be prompt.

SAFETY NOTES

When diving it is customary to carry a diver-down flag either flown on a boat or afloat on an innertube with a carryall net. A line from the float to the diver will assure him of its close proximity and will avoid his being run down by boats.

Personal float. This device, worn like a vest, has a carbon dioxide cartridge for emergency inflation and a tube outlet for breath inflation. It is exceptionally useful for emergency use and fine for supporting an unconscious or disabled diver.

Transporting cylinders. Since a fully charged air cylinder is potentially extremely dangerous it should be transported with great care. Lay the cylinders down so that the valve is toward the back of the car and the bottom of the cylinder is resting against the front wall of the trunk and blocked against side motion.

Filling cylinders. This should be done slowly as there is a rapid increase in temperature. It is preferable to fill the cylinder while it is submerged in cold water. Under no circumstance should work be done on a cylinder while it is under pressure. Avoid striking the cylinder against a sharp object; this can cause a weak spot in the metal which may blow out at some point.

Harness. Check the cylinder harness regularly. Fasten all straps so that they can be easily released.

Lubrication. Avoid using oil or grease on high pressure fittings. Use a silicon lubricating fluid and use it sparingly.

SKILLS OF SKIN AND SCUBA DIVING

Because scuba is so easy to use many participants tend to ignore the need to know basic swimming skills, to understand the nature of the environment into which they will be venturing, and to comprehend the natural laws which govern and control the diver.

Basic skills and watermanship are essential for safe diving. The swimmer should be at ease in the water, versatile in the use of strokes, and have a thorough knowledge of the use of his equipment.

The following skills are generally considered requirements for watermanship in skin and scuba training: underwater swimming, the scissor or inverted scissor kick, the breaststroke, elementary backstroke, underwater dog paddle, bicycle kick, dolphin kick, sculling, treading water, floating, towing methods, methods of submerging (feet first and head first), underwater breaststroke, and dark water stroke.

In addition to the basic strokes students should know how to use the mask, the snorkel and fins, the weight belt, and how to enter and leave the water. Students should learn the use of scuba gear, the difference between open and closed circuit, and the mechanical principal involved in the operation of scuba. Important are methods of doffing and donning scuba gear, buddy breathing.

In combination with the water work, the diver student should have a full exposure to the theory of diving with complete coverage of physics related to diving, medical aspects of diving, fundamentals of compressed gases, basic equipment, first aid, environment and marine life, and planning a dive.

A full explanation of all the foregoing is contained in the Council for National Cooperation in Aquatics publication, *The New Science of Skin and Scuba Diving.*[2]

Personal safety rules

Because of their important relationship to needless accidents, the personal safety rules which follow should always be reviewed and followed before diving:

1. Inspect all equipment for completeness and operating condition before leaving home and again before diving.
2. Refrain from diving when there are any symptoms of illness — even a head cold or an upset stomach.
3. Never dive alone but always in the immediate company of a practiced buddy, remembering that diving in three's also results in one diver being without a partner.
4. Resist the temptation to stay down a little longer or to continue to dive rather than resting as soon as the first sign of fatigue is apparent.
5. Refuse to participate in underwater cave, quarry, or derelict exploration if you are an inexperienced diver, and never without supplemental emergency equipment such as a lifeline, flare, or light.
6. Always use a reliable diving watch to time period underwater and to compute remaining oxygen supply.

Figure 1. Proper instruction and equipment are essential to eliminate hazards for the uninitiated.

Environment and marine life

A factor in diving that varies the world over is, of course, environment. With basic skills firmly in hand the new diver ventures forth in this jet age to areas hitherto unavailable. If he has been well trained he will have a general concept of the most common environmental situations. He will want to check, however, with the local experts to find out the particular environmental hazards of the strange diving area. For example, what are the local references concerning: climate, temperature, bottom contour, marine life, currents and tides, visibility?

Diving on the East Coast is different from the California coast. Diving in Florida caves is different from northern lakes. Special techniques

[2] *Ibid.*

are required to negotiate the kelp beds of the West Coast. Worry about shark or other predatory marine life is of little concern to the lake diver.

What of the peculiarities of current and bottom, what about fallen trees and man-made clutter in dark waters? What of the crush of small boats and their inexperienced pilots? Obviously some caution is required, and a willingness to learn from the locals can be helpful.

Marine life. Sharks are known and feared the world over. They vary from the harmless whale shark to the voracious great white shark with numerous varieties between. Unless the diver is positive of his identification of the species he is advised to use utmost caution when he encounters sharks. At best he is hardly a match for them. There are stories of rare exploits against these fish but generally one is advised to leave the water if possible.

Many divers tell stories of swimming among barracuda. This voracious fish has a mouthful of sharp teeth and can be very aggressive where blood is spilled.

Moray eels usually are content to guard their homes. An inquisitive diver may bear the brunt of an attack. They are best left alone.

Octopus is a peaceful sea dweller of nocturnal habits and retreating personality. The large variety is seldom seen.

The squid is much more aggressive than the octopus and can inflict a severe bite when angered. The giant squid grows up to 50 feet.

Generally, members of the ray family are of little trouble to the diver. If speared or stepped on, however, the sting ray can inflict a severe wound requiring medical attention. Shuffling the fins along the bottom in shallow water should cause the ray to move on.

Coelenterates includes jellyfish, Portuguese man-of-war, sea anemones, and most coral polyps. The sting of the Portuguese man-of-war can be sufficient to hospitalize a swimmer. Jellyfish cause discomfort to the swimmer in mild and sometimes severe form. Protective clothing will help here. Coral made up of millions of living and dead polyps can be a menace to divers since cuts and scratches can easily become infected. These should be cared for.

Other varied forms of marine life include: sea urchins which are dangerous if stepped on as the spines cause infection; scorpion fish, poisonous to man; and sea snakes which often secrete a poison that acts on the nerves. They are usually timid and bite only when threatened.

Barnacles and tube worms because of sharp shells can cause cuts and abrasions which are easily infected.

Lobsters and crabs because of their powerful claws can cause painful wounds and in the case of large lobsters even fingers may be severed.

Sea lions, while not generally aggressive, may become so if the diver inadvertently wanders near young members of the species.

Kelp, a form of seaweed, can be a real hazard to the diver unacquainted with how to negotiate such areas. A diver surfacing in kelp should, with hands overhead, open the kelp and look about for a clear area underwater. Swimming through such seaweed on the surface is a sure way to become often hopelessly entangled. If one does become entangled he should remain calm, quietly disentangle self, and drop under for a swim to clear area.

One should find out from local divers concerning edible fish. Some fish are just not good for human consumption.

Ichthyotoxism is a form of poisoning brought on by eating fish. Nausea, vomiting, and abdominal cramps may occur some hours after eating. This may be followed by diarrhea, numbness, paralysis, and even some inhibition of the senses. Not much is known about the treatment of such a malady, thus there should be an informational survey in advance of eating. Consult a physician if any of the above symptoms are in evidence to an aggravated degree.

First Aid

In diving, much of first aid lore will apply but remember there are such problems as the bends and embolism that are not relieved by ordinary first aid procedures. These items have been treated briefly earlier in this discourse. The trained diver should have gone through a very complete course of first aid with specific referencc to diving problems.

Being properly prepared through training is the best way to avoid accidents caused by simple neglect. When the unavoidable happens, knowing what to do can save a life.

There is an order of priority in first aid. First, is the victim breathing? If not, artificial respiration precedes everything except for unrestrained, heavy bleeding. If the victim is bleeding, appropriate pressure point applications must be made immediately. What of shock? This usually follows an injury and may cause death.

If these three symptoms are absent, carefully examine the victim to discover what his injuries are and try to make him comfortable. Remember there may be internal bleeding, broken bones, severe damage to the neck or head. Know how to deal with bleeding, shock, internal hemorrhaging, decompression sickness, and embolism. One should be familiar with first aid for fractures, burns, and injuries caused by marine life.

The most important first aid program anyone can learn concerns good training, physical fitness, and observance of the basic safety rules of diving by planning and preparation.

References

Council for National Cooperation in Aquatics. *The New Science of Skin and Scuba Diving*. rev. ed. New York: Association Press, 1967.

Gilbert, Perry W. *Sharks and Survival*. Ithaca, N.Y.: Cornell University Press, 1963.

Halstead, Bruce W. *Dangerous Marine Animals*. Cambridge, Md.: Cornell Maritime Press, 1959.

U.S. Navy Diving Manual (NAVSHIPS 250-538). Washington, D.C.: United States Department of the Navy, 1970. 687 pp.

Surfboarding | HENRY F. POHL, A.B.

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Surfboarding ranks as the third most popular individual aquatic sport, surpassed only by swimming and underwater diving. Over one and a half million Americans participate in the sport.[1] Of these, 85% are males under 21 years of age. Surfing seems to have mystical powers on the youths who live, sleep, and breathe it. With the development of the neoprene rubber suit, surfers are able to enjoy the sport year-round. Water of 48 degrees or lower does not deter the young surfers. In fact, some municipalities conduct surfing contests during the winter months.

All over the country surfing schools are cropping up and it is best for a beginner to take lessons. Although many outstanding surfers are self-taught, the process is long and arduous. With modern techniques, learning time can be greatly reduced. An expert surfing instructor can give the youngster all essential fundamental knowledge in one lesson. From that point, it is a matter of long and patient practice. The beginner must get out into the water and spend several hours each day working on his techniques under varying conditions. Every wave is a personal challenge, for no two waves are alike.

Many beginners buy their boards first and then try to learn the sport. Instructors generally use an oversized board which gives stability and buoyancy, for this type of board is the easiest to ride. Many youths, however, want to own the latest and slickest board. These boards are designed for the expert who has mastered the basic skills and can ride a plank. That is why it is best for beginners first to seek advice from a surfing school or surfshop as to which board is most suitable for them.

One does not become an expert surfer in a year or two. It is a long, arduous learning process under all conditions. From the physical standpoint, the smaller, agile surfer makes the more picturesque and better surfer; the heavy six-footer needs powerful waves to push him through the water to gain all the advantages the lighter surfer will enjoy. This is why the little man is the one who gets most of the accolades in this sport. However, when it comes to big wave riding, the larger men come out on top.

Accidents

Fatalities resulting from surfing accidents are relatively few. Most surfing experts consider it a comparatively safe sport. Statistics regarding accidents, however, are limited and unreliable. Most surfing accidents do not disable the surfer

[1] Market research for *Surfing East Magazine.*

for participation while recovering from his injury. Perhaps disabling accidents are minimal because the surfer usually lands on a soft cushion, as compared to an automobile accident victim who is flung onto a hard surface.

The greatest speed that a surfer travels is 25 or 30 miles per hour. His chances of surviving a wipeout (a wave breaking on top of a surfer, causing the surfer to be knocked off his board) or a pearl dive (the nose of the board knifing underwater) depends upon the amount of time the surfer spends on the board during the ride. Once a surfer overcomes the initial moments of the ride, he can generally control any disaster by maneuvering the board into such a position that he will be free from collision with the plunging or flying board. Many surfers are aware of the pitfalls of being wiped out by a wall of water and have trained themselves to hold their breath underwater for 15 to 20 seconds or longer. Once a turbulence passes, the surfer is popped upward and is free to fend for himself. This type of condition exists where huge masses of water break upon a shallow reef.

With the limited areas in which surfers are allowed to practice their sport, loose boards cause many minor accidents which result in injury to the head and torso. In the United States in 1966, fairly reliable statistics revealed that 14 persons lost their lives in surfing accidents. In 1967, five persons died from surfing accidents. One well-known surfer lost his life by not practicing the safety rules of the Bonzai pipeline, an area in Hawaii noted for dangerous waves. The rules require that when a surfer misreads a wave and takes off incorrectly, he should dive back into the wave. This individual, who was an expert surfer in a foreign country and conditioned to deep water, forgot this safety measure and dove head first into the shallow water, receiving fatal injuries.

Broken teeth and noses, cut eyebrows and chins, scalp gashes, and broken ribs are some surfing injuries. A properly trained surfer knows the techniques of rising to the water surface after leaving his board in an emergency. This is a cardinal rule of surfing. Most expert surfers believe that surfing is a safe sport and any injury is caused by negligence on the part of the surfer. Surfing is a calculated risk, which to many is a small price to pay for the precious moments of exhilaration one receives as he whips through a wild wave. Unfortunately, some surfers regard it as a badge of honor to carry scars of the sport; wipeouts and injuries make tremendous conversation for those nights when one is with his closest friends and surfers.

Modern surfboard

This ancient sport of the Polynesian kings was reborn with the advent of World War II. Prior to this time, the West Coast was peppered with surf clubs. They had virtually all the area they could use for this sport. No limitations were placed upon the surfer or his club. During those times the surfer used equipment which only a fine physical specimen could handle and paddle. The boards, which were solid and made of redwood and balsa, weighed approximately 100 pounds or more.

With the development of polyurethane foam, the shape, weight, and performance of the board changed. The change occurred in 1947 with the introduction of the "pig" board, a light, short, and wide polyurethane foam surfboard. Modern technology improved the materials and construction, the fiberglass covering, and the shape until today the average board weighs about 30 pounds, a far cry from the monsters with which the old-timers battled the waves. In today's age of specialization, manufacturers of surfing equipment have devised a surfboard for every possible wave condition. Surfing has probably reached its highest point of technical perfection with the foam board. Manufacturers have done everything possible to make the boards faster and more maneuverable.

Modern surf-riding developed in the United States and the techniques and skills used by the West Coasters have spread all over the world.

Mini board

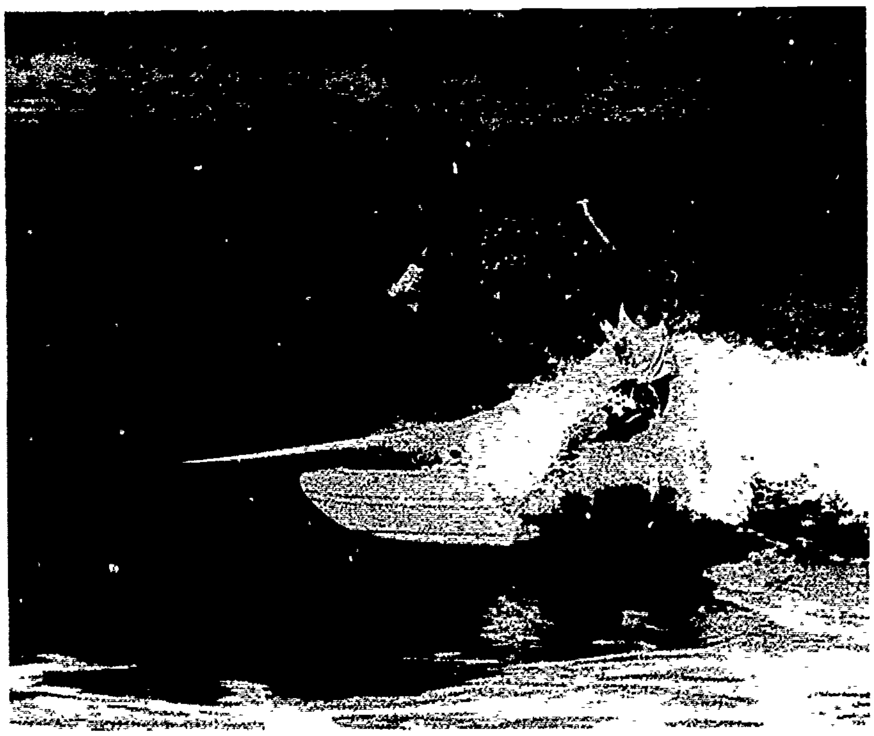
The surfboard, from the beginning, was standardized in length, width, weight, and type

Figure 1. Cutting in front of another surfer about to take off can lead to collision and possible injury.

Figure 2. Courtesy prevents accidents. The bottom surfer is about to "pull out" and swing his board into the path of the other surfer.

Figure 3. Because of shallow water, riding the wave all the way to the beach is a dangerous stunt.

Figure 4. Collision between surfers is a common hazard at crowded beaches and where waves are small and close to shore.



of wood. In 1920, surfers began to experiment with the lengths and shapes of boards. Lightness began to make its appearance with the introduction of the balsa and, immediately after that, the hollow board, patented by Thomas Edward Blake. The most popular boards were solid, 12 to 14 feet long, and difficult to carry and maneuver in the water, for they weighed over 100 pounds. The invention of fiberglass cloth and polyester resin in the 1940s enabled the surfer to experiment with rigidity and protection of the light, soft woods which were used in surfboard manufacture.

Immediately after World War II, a complete revolution of the sport took place with the appearance of foam boards. These boards were light, durable, sensitive to movements, and presented a new challenge to the surfer. The boards rapidly supplanted the balsa and hollow boards.

As surfers began to improve their techniques and discover new adventures in wave riding, manufacturers sought new ideas to market their products in a highly competitive field. They engaged professional surfers to seek new avenues for the expression of their abilities; hence, they began to change the shape, to shorten, and to lighten the boards by using higher density foams.

In 1968, the Mini board, or the short board, with its various shapes and designs, was introduced. Its impact on surfers was tremendous. Within a very short time, the Mini board proved that it was here to stay and has now replaced the heavy 10 foot foam board.

One must be an expert surfer to handle this short, unstable, lightning fast board. The modern surfer is no longer interested in riding the waves in the classic style of a Duke Kahanamoku. He looks upon a wave as a challenge. He wants to "wring-out-the-wave," that is, shoot the wave, climb the wave, "go-over-the-falls," cut right, cut left, and perform maneuvers never before attempted. The Mini board answers his desires for freedom and accomplishment of these feats.

This modern equipment is solely for the accomplished surfer. The techniques are radical, the movements drastically different from those performed on the 10 footers. Only arduous and continuous practice results in mastery of the new Mini board.

Professional surfers who represent manufacturers are constantly changing and improving the modern board. If the present trend continues, eventually a four foot disc made of foam will be created, introducing a new venture into this ancient sport of Polynesian kings.

Safety equipment.

There is a group of surfing enthusiasts who believe that participants should wear protective equipment while surfing. The item that has made inroads into the sport is the crash helmet, which is similar to the one worn by motorcyclists. An outstanding surfing contest on the West Coast demands that each surfer wear the helmet or be disqualified. Many contestants dislike the requirement because they find the helmet cumbersome and a detriment once they are underwater. No contestant has yet claimed that the helmet has saved his life or prevented an injury. Because the majority of surfers who engage in contests are expert enough to handle any emergency, the wearing of the helmet is still highly controversial.

Another suggested item is an inflated ski belt wrapped around the waist of the surfer. Not many have used it, but several surfing spokesmen feel this would be much better than the helmet. Life jackets are a poor device because they need to be inflated before leaving the board. Then, if the jacket were inflated and worn on the board it would be difficult for the surfer to maneuver with it.

Most expert surfers who engage in contests frown upon safety devices, probably because they surf in uncongested areas, know what they are doing, and have expertise. With such favorable conditions, the chances of becoming injured are 1,000 in one. The expert surfers assume that surfers have a better chance of survival if they are unhindered by head gear, waist belt, or carbon dioxide packet. At any rate, the fundamental skill required of a surfer is that he be an efficient swimmer.

Surfing areas

With the approach of spring and summer, up go the signs at the beach fronts warning the surfers of the hours when surfing is permitted. A surfer has two alternatives: to surf early in the morning before the beaches open for bathers and swimmers, or to surf after the beach closes in the early evening. Some municipalities have designated areas where surfers can surf all day. It is in these areas that congestion occurs and many accidents happen. Some areas are marked off by rock jetties, others by wooden bulkheads or by buoys in the water. If all the surfers could be allowed more room there would be less danger of congestion.

The surfer often feels that he has the right of way and incidents have occurred when surfers have literally surfed over swimmers and bathers with their surfboards. Such discourtesy and lack of consideration for others have created animosity and have banned surfers from many areas.

Too many surfers do not observe safe habits. Many ride directly up to the beach. Many young surfers abandon their boards once they feel they are going to be spilled. The loose board is a weapon which causes much danger to bathers. Some beaches confiscate loose boards and make the surfer pay a fine to recover his board.

Formal surfboarding instruction

In the opinion of the author, an instructional program in surfboarding should be divided into two phases — beginner and standard. The beginner course, comprising about eight one-hour lessons, is intended for individuals who have had no previous formal instruction. The standard course, of about 10 hours, is designed for those who wish to perfect the beginner skills and offers advanced techniques to an all-around surfboardman. Each lesson may include an introductory lecture on the topic of the day (10 minutes), demonstration and practice of skills, both land and water (45 minutes), and a concluding question or discussion period (5 minutes). Variations can be made both in time and content to meet different situations.

References

Dixon, Peter L. *Men and Waves: A Treasury of Surfing.* New York: Coward-McCann, Inc., 1966.

———. *The Complete Book of Surfing.* rev. ed. New York: Ballantine Books, Inc., 1969.

Kirk, Cameron and Hanle, Zack. *Surfer's Handbook.* New York: Dell Publishing Co., 1968.

Kuhns, Grant W. *On Surfing.* Rutland, Vt.: Charles E. Tuttle Co., Inc., 1963.

SAFETY IN WINTER SPORTS

Ice Skating | CARL W. MOEN, B.A.

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The exact date of the origin of skating is uncertain, although it is referred to in literature as early as the 10th century, and possibly dates back even earlier. It very likely originated in Scandinavia.

The first skates were fashioned from bone or wood fastened to the feet with strips of leather. Next in the transition of the skate was the use of iron, and finally steel. In 1850 steel-bladed skates were invented by E. W. Bushnell of Philadelphia; his invention truly marked the beginning of modern day skating. Adaptations included the skate designed for speed skating (indoors or out), figure skating, hockey, or for any other special usage.

Principles of Safety

1. A major principle of ice safety is *respect the ice.* This is fundamental in the development of a sound philosophy of ice safety.
2. Man's drive for safety underlies the entire safety program. A man in combat understands this principle very well. It may be actuated by fear or panic, yet when understood and properly disciplined, it is the most powerful motivating factor in safety.
3. Safety is a state of mind and it is best achieved through education and experience.
4. Ice safety is based upon a knowledge of the physical characteristics of ice. Without this background, it is difficult to understand the dangers inherent in this winter sport and recreation.
5. A cardinal principle of safety is the law of transfer of training. Safety consciousness developed at home, learned on the athletic field, implanted in the shop, or acquired on other fields is transferred to the out-of-doors and contributes materially to our safe conduct on ice.

Ice is a relatively safe playground; basic to all ice and water safety is the knowledge of how to swim. This may seem far afield when writing about ice safety, but many a life has been saved because the victim of a plunge through ice did not panic. A case in point is a man who stretched his arms up on the ice, permitting his mittens to freeze to the ice before pulling himself to safety.

In this field, the American Red Cross deserves recognition for inaugurating the *learn to swim program* and for its continuing leadership. Major credit also must be given to the National Safety Council for coordinating, motivating, and directing the safety program on a state and national level in order to achieve a united effort on all fronts to prevent needless injuries and accidents.

FACTS ABOUT ICE

Since safety is all-inclusive, ice safety should include the hazards of ice. Safety in skating must anticipate many hazards, such as unsafe ice at inlets and outlets of lakes fed by springs and areas between the stakes of the nets of fishermen where a large catch of fish struggling in nets will wear ice paper thin. These are some of the hazards which are multiplied by the early freeze-up and the spring thaw.

What is said here about the physical characteristics of ice applies equally to iceboating, fishing, or any other activity on ice. Several years ago the newspapers reported an accident on ice involving a snowmobile towing a sled with five aboard (a father and his four children). The snowmobile crashed through thin ice near the inlet of a lake. This accident involved a crucial lack of knowledge about lakes and the formation of ice.

Water exists in the atmosphere as a vapor and is precipitated as rain and snow, dew and frost, water and ice. These forms are all chemically related, but physically they have widely different characteristics.

Many people are familiar with the actions of streams and lakes during the summer, but little thought is given to the winter phase of their annual cycle. With the coming of cold weather, the water in a lake or stream is gradually cooled. Temperatures within the mass of water tend toward uniformity due to continuous, turbulent currents. Cold, dense, surface layers sink, and the lighter bottom layers of warm water rise toward the surface.

Gradually the entire mass attains a temperature of 39.2 degrees F. (point of maximum density); the surface film of water is further cooled, and when it approaches the freezing point, needle-like crystals of ice called frazil ice begin to form. On small lakes, or in the sheltered portions of large lakes, ice begins to form when air temperatures fall below freezing, yet wind and wave action may prevent the complete freezing of large lakes even when the air temperature falls below 32 degrees F.

Depending upon the degree of turbulence, as well as the temperature, the crystals of frazil ice unite and form little floating masses of ice, which continue to grow by accretion of other similar ice masses. If this growth is accomplished without crushing, a thin sheet of rubber ice forms.

Freezing often occurs very suddenly, six inches of ice cover forming in a few days. However, normal winter temperatures in our northern tier of states rarely produce sheets of ice more than 30 inches thick. On the other hand, on Great Slave Lake in northern Canada, ice begins to form about October 15, freezes to a maximum depth of 5 to 6 feet in March, and goes out in late June. Sea ice on the Arctic Sea is said to be about 15 feet thick, which is sufficient for ice safety.

Most of us have some knowledge about sleet, hail, glaze, frazil ice, and anchor ice, but few bother to inquire about the detailed characteristics of just "plain ice."

Liquid water is a mixture of several molecular forms of H_2O, only one of which can change into solid ice. Water, upon freezing, increases about one-eighth in bulk, but the resulting ice is less dense than the underlying water, and so it floats.

Ice has nearly eight times as great a capacity for thermal expansion as steel. Ice on a lake surface expands or contracts with the rise and fall of the air temperature, and since air temperatures have a considerable range of fluctuation in winter, the ice changes in volume. An appreciable drop in temperature causes the ice to contract, producing cracks which refill with more ice. When a subsequent rise in temperature produces an expansion of the whole ice mass, a tremendous force is exerted against the shore, often in excess of 30,000 pounds per square foot. Imagine this impact upon shoreline beauty and upon the safety of ice travel.

Extreme cases have been noted where ice action has moved houses off their foundations, destroyed retaining walls, damaged cottages, and uprooted trees. Expansion of a sheet of ice 150 feet in width has been known to move a masonry bridge pier weighing 1,000 tons two inches out of plumb, and in another instance masonry piers on pile foundations have been pushed from 2 to 12 inches out of line.

When is ice safe?

Recreation on ice is 20 times safer than other recreational sports on water and 50 times safer than travel on our streets and highways. This is based on a 25 year study of fatalities on ice, water, and highways.

When is ice safe? Any answer must be conditional. Ice might be safe for a man on skis, but unsafe for a man on foot. Ice may not be of uniform thickness because of the thawing action of lake bottom springs of flowing water. Generally, two inches of ice are considered safe for a man on foot and four to six inches will support groups of people and vehicles. Four inches thick is considered safe for light loads and eight inches thick is considered safe for loads up to 1,000 pounds per square foot. *Transportation on ice should not be attempted unless a wide margin for error is allowed.* It is said that ice 15 inches thick will support a railway train. In fact, during the Russo-Japanese War shortly after the turn of the century, the Trans-Siberian railroad begun in 1891 was extended on ice across Lake Baikal to connect the east and west links during the winter. This strategem of trains on ice was repeated in the defense of Stalingrad during World War II.

Ice safety

When one is preparing for an outdoor journey on ice, whether it be skating or any other activity, there are certain items of equipment and certain things to remember that may save one's life. A pair of ice awls, which can be carried with a strong cord around the neck, should be purchased. A hank of rope is a must if one is on an extended ice expedition with a friend or party. Know the lake, make sure the ice is safe, and abstain from free-lance skating over the wide reaches of the lake.

When walking or skating on ice, always remember the rule, "If you feel you are breaking through, throw yourself forward and out flat, if you possibly can." One may reach firm ice or at least have sufficient purchase to pull or wiggle his way out. At any rate, this action may keep an individual from going down under and getting lost under the ice.

If the individual falls through the ice but has his arms outstretched on the ice, he should use his feet as a propeller and edge himself up and onto the ice. Getting out of water is greatly simplified if the person equips himself with a pair of ice awls. They are not cumbersome and can be a real lifesaver.

If an accident happens, the help of a companion can be crucial. If an individual and his companion are properly equipped with a rope, the rescue can be expedited. Or if nearby there is a long branch or a pole, these could be used. If these props are unavailable, but there are two or three companions, the "human chain" method can be used to effect the rescue: lie face-down on the ice, grasping the ankles of the person ahead and edging forward until the front person can reach the individual in distress. Lying prone does not require much ice to support the human body.

After rescue has been made the job is only half done. The clothes of the person rescued are going to freeze and make the victim practically immobile. Shelter and warmth should be sought immediately. The shelter may be a car with a heater, it may be a fishing shack, a warming house for skaters, or a house a mile or so away. Waste no time in getting to shelter.

Hockey

As skating developed, a natural outgrowth was hockey. Canada is recognized as the birthplace of this international sport. As early as 1855 the first recorded ice hockey was attributed to the Royal Canadian Rifles at Kingston, Ontario. Later, the first organized game with prescribed rules was played at McGill University in Montreal with possibly 15 players on a side.

Rule changes followed rapidly until 1926 when six became the number of players on a team.

Hailed as a great contact sport, safety became a prime consideration from the outset. Protective clothing was adopted and today is standardized largely with the exception of professional hockey players, who for one reason or another disdain wearing the helmet. A recent death, however, from brain concussion by a professional hockey player may hasten the day when helmets will be worn by all. Safety considerations should make it mandatory.

Figure and speed skating

Figure skating has become a major competitive sport involving first sectional championships, next the United States championships, then the North American championships, and finally the world championships. Of no less complexity has been the growth of speed skating as evidenced by the United States Outdoor and Indoor Championships flanked by the United States Open Indoor and Open Outdoor Championships. Skating has come of age. Hazards exist in both figure and speed skating but they are largely of the nuisance variety and are of slight importance to the safety program.

Ice show spectaculars

It was only natural that skating should lend itself to showmanship. The advent of mechanical refrigeration brought skating indoors. Almost immediately skating was destined to become a great spectator sport. The "Ice Follies" was first produced by Oscar Johnson and Edward and Ray Shipstad in 1936. In 20 years it was estimated that this one show played to over 40 million people. In rapid succession followed the "Ice Capades," "Sonja Heine Ice Revue," and the "Holiday on Ice Shows." Shows on ice have come to stay as a major attraction of the entertainment world. From the standpoint of safety these shows are self-policed, have excellent medical supervision, and cause no real concern to the public.

Skating on an ice rink or controlled and supervised area is one thing, but free-lance skating on the wide open spaces of lakes and streams poses far greater hazards. Safety on ice is predicated on a few basic principles and on a knowledge of the physical characteristics of ice, its formation, and inherent variations.

Ice accidents

Accidents incidental to ice skating parallel those of other sports — sprained ankles, bruises, a broken arm or leg, or a concussion from a fall or other injury. But the accident that merits special attention is drowning. It is unrestricted child play on ice that most often leads to drowning.

Parents should be acutely aware of the dangers of thin ice. Drowning tragedies occur every year because children skate, walk, or play on a glazed-over body of water. Children are fascinated by ice and do not seem to realize the danger of thin ice. They find delight in playing on "rubber ice."

Children should be allowed to skate only in supervised areas with a companion, never alone. They should be taught to stay close to shore where the water is only waist deep. They should be warned against congregating in groups and against building warming fires on the ice.

Unsupervised child play is possibly our greatest safety hazard, a crime chargeable in many cases to parental delinquency.

SUMMARY

Safety is not a prescribed formula to be applied in any one given area. It is not wise to isolate safety in ice skating from all other avenues of safety. Safety is a state of mind. Consider the following summary statements:

1. Recreation on ice is 20 times safer than recreational sports on water and 50 times safer than travel on our highways.
2. Nothing is important, including safety, unless it bears on the welfare of people.

3. Ice is safe — safe enough to carry a railroad train!
4. The most disastrous i[illegible] accident of the century was the sinking of the Titanic on April 14, 1912 with a loss of 1,513 lives.
5. Studded tires are on trial in connection with ice safety.
6. Ice has nearly eight times as great a capacity for thermal expansion as steel. Ice is a greater hazard to property than to life. It is destructive of shoreline beauty.
7. Water, in one form or another, has the greatest recreational potential of all our natural resources.

Snowshoeing | ROY MORRIS, B.A.

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One day in central Asia about 4000 B.C. somebody became tired of being snowbound and devised a way to walk up and across the snow by fastening crude wooden slats onto his feet. Hence, the first snowshoes, direct parents of the ski, were born. The idea did not happen anywhere else; the rest of the world had to wait for it to emerge out of Asia. After that, men for the first time were able to track and take their game regardless of heavy snow and to inhabit once inaccessible lands in northern North America, northern Japan, Outer Mongolia, Siberia, northern Europe, and Scandinavia.

Today, after 6,000 years, snowshoes endure not only because of the ranchers, foresters, scientists, and utility linemen who use them, but also because of their popularity as a sport. In the high mountains it is increasingly common to find snowshoe trails, many of which span into areas where even snowmobiles and skis are prohibited. Although there are some dissenters who say snowshoeing is not really fun, but hard work, increasing numbers of people have welcomed it as an inexpensive addition to their winter entertainment.

A snowshoer enjoys firsthand what many can only experience vicariously at the movies. First, there is the sense of walking on water. Then, only yards from the road and into the trees, one finds himself included in nature's living room. With hushed excitement he sees fresh tracks crossing his path or an incredible creation of deep-fallen snow. Suddenly, a pine squirrel shatters the silence with a tirade against intruders while a porcupine peeks from behind a trunk only one-third the size of his stomach. One fascination follows another until it is time for the snowshoer to retract his tracks. He is surprised to realize what a small patch of space it takes to make a wonderland.

The chief dangers to consider when snowshoeing are bad weather, fording streams, and snowslides. Beyond that, if one remembers to travel in company and carry a ski pole for pretesting certain steps, he will probably have a safe trip. A very important tip is to walk naturally. Comfort depends upon loose but warm clothing, goggles, and waterproof boots. Pleasure, of course, depends upon planning. If one remembers to bring food, a camera, matches, binoculars, and other items that are important to him, he will have a pleasurable trip. Finally, the snowshoer should seek the advice of someone experienced when selecting shoes, even when only for rental.

Figure 1. A winter sportsman hikes in snowshoes.

Figure 2. A snowshoe with considerable upturn at the toe is best for light, unpacked snow. Longer shoes are used for distance travel.

Skiing

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Apart from its highly touted glamour, skiing offers advantages seldom afforded by other sports. Skiing may be a team or group endeavor, and thus has something in common with most other athletic activities at the high school or college level. However, it is almost unique in that it can be enjoyed equally well singly or in groups. An even bigger benefit enjoyed by the skier is that he can continue to ski after leaving formal educational environs.

Skiing tends to have universal appeal because there are few people physically incapable of skiing. Indeed, the loss of hearing, sight, or even an arm or leg does not preclude skiing. All ages ski. As opposed to football, basketball, soccer, and other team sports, two teams aren't required for skiing.

Because skiing has traditionally been somewhat removed from the typical high school or college athletic program, it is often judged harshly by the uninformed. Thus ski safety is usually presented in the negative sense of prominent people with broken legs and plaster casts and a host of circumstances implying inherent dangers.

Certainly much of the misunderstanding surrounding skiing stems from the fact that the sport has, in the United States, only recently come of age. With a few notable exceptions, published data on ski safety has consisted of opinions often unsubstantiated by fact.

Any safety program is contingent upon universally accepted definitions; we will use the definitions of the National Ski Safety Research. While these definitions are by no means universal, they are similar to those used in the study of ski safety that provides the background for this material.

Skier. Any active participant in the sport if only for a single day. The individual need not own equipment to qualify as a skier.

Injury. Any physical disability suffered as a result of skiing or using uphill transportation (while wearing skis) in order to ski (i.e., a ski lift or tow).

Ski area. Terrain used for skiing regardless of height, acreage, ancillary facilities, etc.

Bindings. The apparatus which holds skier (boot) to ski. Essentially, all currently available bindings employ some mechanical system designed to release the boot from the ski following the application of certain stresses. The term "release" or "releasable" binding could be used. However, this is currently being discouraged because the adjective "release" (or "releasable") often, and wrongly, implies a measure of safety, much as the older term, "safety binding," did.

Figure 1. Good technique leads to enjoyment of skiing and the outdoors.

PROBLEMS UNIQUE TO SKIING

A system of uniform injury reporting in skiing is almost nonexistent. Thus we lack valid information regarding the number of skiers and the number who are injured.

Injuries sustained by skiers are reported for reasons far more capricious than most investigators care to admit. Although most disabling injuries (i.e., fractures and major sprains) come to the attention of persons in the area, these injuries represent, at most, a quarter of all ski injuries. The less severe injuries are reported to the area people for a variety of reasons. For example, injuries occurring to preteenage children are more likely to be reported than those involving skiing conditions within the realm of control of the ski area (e.g., injuries occurring on uphill transportation devices or those caused by rutted trails or exposed rocks). On the other hand, male and more expert skiers are less likely to report their injuries.

The lack of consistency in the reporting of injuries makes it difficult to ascertain the problems that will face the high school or college athletic supervisor responsible for skiing programs. He will, no doubt, have a high percentage of the injuries reported to him and, as a result, it will appear that an inordinate number of his students is being injured. Like the instructor of a ski school class, he will find himself in a position of being "responsible" for the safety of the skiers; this is a situation almost unique in skiing.

A problem intrinsic to ski areas stems from the fact that unless the skier is a member of a ski school class, he is a free agent on the slopes. Restraints regarding traffic control, reckless skiing, and discourteous acts are generally kept to a minimum. In addition, skiers are free to ski where they please.

Trail Markings

The current universal system of trail markings classifies the various slopes as to difficulty. There is still nothing except the sign to prevent the novice from attempting to ski a slope for experts. Although this situation rarely yields injuries, the loss of self-confidence resulting from a prolonged, terrifying journey down a too difficult slope can be devastating. Class instruction or supervised group skiing can easily alleviate this problem.

Lifts and tows

Skiing involves active and passive injuries. The former are those occurring while the individual is actually skiing; the latter involve the use of the various uphill conveyances.

The well managed ski area not only posts directions regarding the proper method of using uphill transportation, but also helps the neophyte board the lift his first few times. The skier must, however, indicate a lack of familiarity with the lift equipment, an admission seldom made by teenagers.

The injured skier

Finding, transporting, and caring for the injured skier involve circumstances not commonly encountered in other sports. The reporting of a ski injury and locating the injured skier should involve no problem if the skiers follow posted instructions, do not ignore "closed" signs, and *never* ski alone. The buddy system so successful in swimming is equally applicable in skiing.

Skiers should know how to obtain help at the particular area in use. The injured skier should be marked with a pair of skis stuck upright into the snow so they form an "X" at a location slightly uphill from the injured skier. The injured skier should be allowed to lie where he has fallen. If a ski remains attached to the boot it should be removed only if it is causing pain and only if it can be accomplished without causing additional discomfort to the skier.

In case of accident, the ski patrol should be notified. The injured skier generally *should not* be moved, his boots *should not* be removed, and no attempts should be made to correct a deformity involving an arm or leg. The ski patrolmen who aid the injured skier are specially trained to deal with these problems.

Aid to skiers

The ski patrol merits additional mention. There are no uniform, enforceable rules regarding the training and expertise of the individuals who will be responsible for giving first aid and transporting the injured skier off the slope. Individual ski areas are free to establish their own qualifications regarding the individuals they designate as ski patrolmen. These designees usually wear parkas marked with a cross and/or the words "Ski Patrol."

There is a national organization, the National Ski Patrol System (NSPS), which establishes and teaches the optimum methods of handling injured skiers. The actual first aid is within the framework of the American Red Cross while the transportation methods have been developed by the organization. Ski patrols (and patrolmen) affiliated with this organization usually wear a rust colored parka with a blue and gold patch displaying the words "National Ski Patrol." The group consists mainly of volunteers who do an admirable job with rescue and first aid.

In addition to the NSPS volunteers, most ski areas hire at least one full-time, paid patrolman. Larger areas may use full-time, paid, professional patrolmen who are generally, in every sense of the word, truly professional rescuers and skiers. These professional groups may or may not be NSPS affiliated. A lack of this affiliation implies nothing regarding competence in the work involved. Indeed, employment requirements (e.g., first aid and rescue training and skiing ability) for paid professional ski patrolmen are, almost without exception, more stringent than those required by the NSPS.

Regardless of the area's ski patrol affiliations, it is of *absolute* importance that the area selected for organized student skiing have a ski patrol of adequate size and training.

Evaluation of the injury

After the injured skier has been transported off the mountain and to the first aid facility, there remain two rather formidable problems: (1) who is available to determine the extent of the injuries and (2) how will the injured skier be transported to medical facilities for treatment?

Only the larger and more affluent ski areas will have a physician. If there is no resident physician, then the injured skier must be taken to a medical facility. One must assume that the ski patrolmen or first aid attendants at the area will be capable of preparing the patient for this journey (e.g., applying splints and dressings).

One must also assume that the journey will be necessary. It goes without saying that the skier who is injured severely enough that he is brought to the first aid facility for treatment merits a physician's examination. "Over diagnosis" or judging a minor injury to be a severe one, is generally not the problem associated with the evaluation of ski injuries.

Many ski areas will have available an ambulance for transporting injured skiers. If this is not available, especially in the case of school sponsored, supervised skiing, this contingency must be provided for.

Ski injuries should be treated *as soon as possible*. The injured skier should not have to wait hours for a bus. In most cases the back seat of a car will serve adequately as a makeshift ambulance.

Because skiing is not an on-campus activity, it presents other potential problems. The most significant is transportation to the ski area. Motor vehicle accidents are, in themselves, important considerations; they become more so when coupled with icy roads, hilly or mountainous terrain, crowded vehicles with fogged windows, and loose, sharp, and heavy ski equipment in cars. It is quite probable that the trip to and from the ski area constitutes a more significant threat to the participants than does the actual skiing. Thus, in addition to the accepted safe driving recommendations, the following should be stressed as well:

1. Skies, boots, boot trees, and poles should never be carried in the passenger section of the vehicle.
2. Drivers should wear adequate, protective sunglasses which should be grey or grey-green and dark enough to transmit only a quarter of the light presented to them.
3. Ski boots should not be worn by the driver of the vehicle.

ACCIDENT DETERRENTS

Because of lack of information, it is difficult to determine whether skiing, in general, is becoming more or less safe. Because the sport lacks the organization and supervision of school-oriented sports, we are unable to compare specific skiing safety trends with those of other athletic endeavors.

As skiing is one of the most vigorous athletic activities and is practiced mainly by non-athletes, its safety record is admirable. The lack of uniformity of injury reporting precludes the calculation of an absolute injury rate (i.e., the number of injuries per 1,000 skiing days). However, there exists no indisputedly valid, published report that places the reported injury rate at greater than 1%. Indeed, most reports place the rate of reported injuries at between three and six injuries per thousand ski man days, i.e., three to six *tenths* of 1%. When this figure is compared to the 20% to 30% seasonal rate reported in some high school and college contact sports, the magnitude of the ski injury problem is placed in a more proper perspective.

Various facets of the ski industry have not been content with the safety record and have instituted programs designed to promote safer skiing.

ORGANIZED SAFETY EFFORTS — SKI AREAS

Among those displaying the most active interest in injury prevention is the National Ski Areas Association. This group's development, promulgation, and enforcement of a uniform code for uphill transportation facilities (lifts) stands as a major milestone in injury prevention. Because of this organization's efforts, the severe (although never common) lift related injuries have nearly become a thing of the past.

Uphill transportation facilities continue to account for about 10% of all reported ski injuries. However, most of these injuries are a result of skier ineptitude. This is evidenced by the fact that most occur to novice skiers and are unrelated to lift malfunction.

The fact that these injuries are more frequent on the less sophisticated lifts (e.g., rope tows) offers further credence to the novice aspect of these injuries. Many areas reserve their more elaborate lifts (chair lifts, gondolas) for the longer journeys to the more difficult slopes.

Thus, most lift oriented injuries are clearly the responsibility of the skier, a responsibility to be shared by the supervisor of a school sponsored ski program. Most ski areas will be willing to assist the supervisor in assuming this responsibility by detailing employees to instruct in lift usage. Thus, the sponsor need only provide the pupils for this instruction.

Although there is no specific policy among ski areas on slope grooming, the National Ski Areas Association (NSAA) provides for the interchange of information. This allows member areas to use techniques developed elsewhere.

Ski injuries resulting from improper hill grooming are exceedingly uncommon (5% of reported injuries). This low incidence is, generally, the result of current grooming techniques.

There remain, in the ski world, zealots who contend that learning to ski under less than desirable circumstances (ice, rutted trails) produces better skiers. There is little statistical evidence to support this contention. There is, however, an equal paucity of evidence indicating icy conditions as a major causal factor in ski injuries.

Thus the party responsible for a group of student skiers (particularly if the students are neophytes) can rationalize using a well-groomed area only on the basis that it will provide more pleasurable skiing. This would surely seem to be an adequate rationale.

Instruction

If a goal of injury prevention can be attained by active participation of the industry and only passive involvement of the individual skier, then the situation is ideal. Herein lies the success of programs instituted by area operators. Significantly, another group in the ski world actively promotes ski safety with an even greater degree of personal skier contact. This group is the Professional Ski Instructors of America (PSIA).

At present, the most effective deterrent of ski injuries is an increase in skiing ability. This is particularly true for the least advanced skier. The more advanced skier capable of "stem turns" or more exacting maneuvers does little to decrease his injury rate by increasing his ability. However, at these more advanced stages, increased proficiency generally leads to more enjoyment at a minimal injury rate.

By establishing uniform ski instruction and techniques throughout the country PSIA has made it possible for a skier to enjoy a continuum of ski instruction regardless of the area in which he skies. This is of particular importance to the person responsible for student skiers. Ski injuries are almost nonexistent during ski lessons under the direction of a certified ski instructor. This in itself should be reason enough to seek the assistance of a ski school under the direction of a certified ski instructor.

Trail markings

A recent joint effort within the ski industry also merits mention in regard to ski safety, the system of uniform trail markings. The student skier should be acquainted with the shape, color, and meaning of these signs before he begins skiing.

The signs are presented in the context of each individual ski area. A sign indicating a "most difficult" trail or slope simply means that the particular slope is "most difficult" for that area. Another ski area, five miles away, might have a slope that is far easier (or more difficult) rated with the same sign because the second area's designations relate only to its slopes.

However, the markings are consistent from area to area because the various degrees of difficulty are always presented by signs of similar colors and shapes. A few words from the supervisor can indicate the general degree of difficulty of the particular area to be skied. The markings can then be placed in a proper frame of reference.

The neophyte skier must also be acquainted with the "rules of the road" and the common courtesies of skiing. These include: stopping only on the sides of trails or slopes — never in the center; using Arlberg straps (or some kind of tether) to prevent runaway skis; looking uphill before skiing onto a trail or slope; and acting in a courteous manner.

FIRST AID

A discussion of first aid for injured skiers might indicate a lack of faith in a safety program. There are, however, two reasons for considering first aid material: (1) In a practical sense, no safety program will prevent all injuries, and (2) the first aid of ski injuries differs appreciably from general first aid.

Ski injuries occur in a cold environment — an ideal medical circumstance. A combination of snow and low temperature decreases the amount of pain and swelling accompanying the injury. While this is advantageous from a diagnostic and treatment standpoint, it often generates a feeling of complacency regarding the severity of the injury. The fact remains that *serious ski injuries are often relatively painless.* Even when painful, the injuries are often more severe than would be expected on the basis of pain and swelling alone.

Minor injuries, especially those involving the ankle and knee, require a physician's evaluation. It is possible, in the first few hours, to walk (and indeed, ski) painlessly on a broken leg or a knee with massive damage to the ligaments.

First aid for ski injuries involves splinting and the avoidance of heat application. Ski boots *should not* be removed on the slope. A snug boot splints the ankle and provides a fixation point for the application of a long leg splint. The boot will also impede swelling.

Bleeding resulting from open wounds (usually lacerations from ski edges) can be controlled by pressure bandages placed over the wound. Compound or open fractures should be covered by sterile dressings. A protruding bone should not be withdrawn beneath the skin. Regardless of the severity of the injury, the injured part should be elevated above the level of the heart if possible.

If the skier does not immediately seek a physician's evaluation, he should not take a hot bath or shower. Ice packs should be applied to the injured area. Heat *should not* be applied during the first 36 to 48 hours after the injury.

First aid should be the responsibility of the ski patrol. This is still another reason for choosing a ski area with an adequate ski patrol.

THE INJURED SKIER

Many individual considerations have been tentatively indicted as causal factors in ski injuries. This list includes: age, sex, marital status, occupation, physical condition, and geographic location. Statistical credence can only be associated with age and sex of the skier. The relationship of the other variables to an increased incidence of ski injuries appears to be a function of age, sex, and/or skiing ability.

Age

There appears to be a statistically significant relationship between age and the rate of occurrence of ski injuries. Generally, the increased incidence involves those skiers of both sexes, and all abilities, before age 21 or 22; this is most pronounced prior to age 19 and 20.

Age probably serves only as a measurable parameter of some other variable (yet unknown) responsible for the increased incidence of injuries. Regardless of the true cause, the age factor acts almost universally in the "student-skier" age group; therefore, the school designated supervisor must be particularly diligent in the promotion of his safety program.

Sex

Sex is the other measurable parameter responsible for determining injury rates. More is involved here than the increase in injury rates associated with females. Interestingly, this sex difference does not appear prior to puberty. When it does appear, it does so at the age of female, not male, puberty.

This all may be on a pure physiologic basis. It is doubtful that the increased injury rate in females is secondary to the lack of conditioning as some authors would contend. Regarding the skier of student age it has yet to be shown that females are in less ideal physical condition than males of a comparable age.

Thus, again, although we are not sure *why* females are more likely to be injured than males, the increased rate is statistically significant and safety programs for female student skiers must be pursued diligently. (Ski instructors agree generally that beginning women and older males find the short ski of assistance during the learning process.)

Skiing ability

Until someone determines why females or young people are more ski injury prone, we cannot correct the increased incidence of injury. For this group of persons we must be more diligent regarding proved safety measures. Expertise of the skier, on the other hand, is a controllable factor. The fact that the incidence of ski injuries *decreases* with increasing ability is well accepted. Various reasons have been suggested for this:

1. The anatomically awkward posture assumed by the novice skier in the snowplow position. This would seem to be related to the incidence of injuries, but proving the relationship statistically significant has yet to be undertaken.
2. The inability of the novice to "fall properly." Statistical support of this contention is also lacking.
3. The increased frequency of accidents (falls, not necessarily injuries) in the novice groups. It may be that the incidence of ski injuries is directly proportional to the incidence of ski accidents. The distinction between "ski accident" and "ski injury" is an important one.
4. Increased frequency of "lack of control" in the novice groups. The importance of "being out of control" as a cause of injuries is open to question. By definition, almost anyone who is injured skiing was "out of control" at the time of the injury. If he was "in control" we must assume the injury was intentional.

Preventive measures relating to ability are obvious; *improve the skier's ability* and the likelihood of his being injured will decrease. Thus, ski lessons are the keystone to an effective safety program.

Ski lessons not only increase the skier's abilities, but of equal importance, place the skier in an environment that is virtually injury free. If we are to believe the opinions of many authors regarding the causes of injuries (e.g., "out of control," skiing too difficult terrain, and skiing too fast or recklessly) then the skier's presence in ski school will preclude the existence of these variables.

Regardless of what philosophy of ski safety one chooses, ski school, under the direction of a certified ski instructor, offers distinct safety advantages.

SKI EQUIPMENT

Ski equipment is more frequently assailed than any of the variables involved in ski safety. The bases for these attacks are many and varied. The skier blames his bindings for his injuries (quite possibly with some justification) often because there is nothing else to blame. However, most injuries cannot be validly related to negligence on anyone's part.

The skier is often led to believe that a particular binding offers a greater degree of injury protection than other brands. Advertising, usually by implication, is frequently misleading. Regardless of the claims, there is no study that lends credence to claims made by *any* manufacturer regarding the safety advantages of his bindings.

There is only a minimum of evidence supporting the hypothesis that the use of bindings with release capabilities leads to fewer injuries. Part of this is, no doubt, because of our investigative inadequacies — it is virtually impossible to compare current equipment with equipment of older design as both are not used concurrently. Older studies are not available for comparison purposes.

Equally difficult is any attempt to establish differences in safety records for various bindings. Even if such differences did exist, proof would be a long time coming. Establishing matched groups for a meaningful statistical study would be a prodigious task.

The consensus of the skiing public seems to be "there are bindings available that will protect." This rather idealistic view may be true, but only if qualified by two statements: (1) the bindings must be installed properly and (2) the bindings must be adjusted properly. Improper installation is a major cause of "binding failure injuries."[1] Unfortunately, the average skier has neither the know-how nor the testing equipment to determine whether or not a binding is correctly mounted. He must depend on the expertise and integrity of the "reputable ski shop." Any attempt to define such a shop is meaningless. However, the barest *minimum standard* is that the shop must adhere scrupulously to the binding manufacturers' instructions. Fortunately, many shops do this.

The use of a binding test device has its maximal usefulness in determining proper installation of the binding. Although National Ski Safety Research has used all three testing devices, the major experience has been with the *lipe release and heel check*, and discussion will be limited to that apparatus.

The boot toe must be released with *equal ease* from medial (outside) pressure. The test apparatus gives a reproducible value for the amount of pressure required to release the boot. The value should be the same medially and laterally.

All major bindings are symmetrically designed, so the mechanisms for medial and lateral release are identical. Thus, if forces of different magnitudes are required to effect release, the symmetry of the system has been disturbed and the binding is not functioning properly.

Asymmetry can result from protruding screw heads, improper alignment, misplaced toe plates or toe notches, and a host of other causes. The skier should *not* be required to determine the cause, but only the effect, which is unequal medial and lateral release. The cause of the malfunction should be determined and corrected by the ski shop.

The problem of faulty bindings is of sufficient importance to merit procurement of a test device. Certainly, an institution responsible for a student ski program should use such a test device. Purchase price need not exceed $15. Bindings *should* be tested before each use, but if this is impossible, they should be tested at least three times each season.

The proper binding adjustment is unknown. Current concepts generally rely on the skier's weight, sex, and expertise to arrive at a proper setting. There is little scientific evidence to sup-

[1] A "binding failure injury" is one that would not have occurred had the boot released from the ski earlier in the course of the fall.

port any of these criteria. Indeed, the only published, statistically valid support is that of Haddon, Ellison, et al., who demonstrated a trend that bindings with release capabilities offered less protection to females than males.[2] There has been no published report showing that heavier skiers require tighter adjustment of their bindings or that novices require more loosely adjusted bindings than experts.

The evidence appears clear on one point alone — that most injuries *might* have been prevented had the bindings released earlier. Some people argue that premature binding release is an important factor contributing to the incidence of ski injuries. Our studies have shown consistently, however, that premature or inadvertent binding releases are responsible for less than 5% of all ski injuries.

Bindings should be adjusted to minimum settings. Countless ski instructors, professional ski patrolmen, and even those among the most famous racers are able to ski to their maximal capabilities on bindings set at adjustments recommended for 100 pound female beginners.

Recommendations for adjusting bindings are:

1. With the use of a testing device, determine if the bindings release equally in medial and lateral directions.
2. With the skier in his boots and the boots attached to the bindings, immobilize the skis. The skier should then be able to twist either boot from binding in either direction without pain in the ankle, leg, or knee.
3. See that heels release while leaning forward in the bindings and before any discomfort is felt in the calf.
4. Mark skis left and right and always use accordingly.

Other ski equipment

Boots, skis, and poles account for a very small proportion of ski injuries. There are, however, a few points worthy of mention:

1. All skiers should use some device to prevent runaway skis. This may be an Arlbert strap with its two point fixation to the ski; a check-rein fixed at one point each to binding and boot; or the spring-loaded, metallic device which stops the ski by digging into the snow.

The devices that attach binding to boot have been condemned as dangerous. The danger is reputedly a result of the ski (after binding release) "wind-milling" around the fulcrum provided by the strap attachment. Although this circumstance does occasionally exist, its incidence is minimal compared to the danger encountered with a runaway ski. The additional problems of retrieving the ski or negotiating a slope with only one ski are also significant.

2. The straps on ski poles should be used with caution, if at all, especially in the case of the novice skier.

Ski pole straps are designed and used to prevent loss of a pole, but a pole is rarely dropped without provocation. Pole loss is usually the result of catching the pole in deep snow, or on a tree limb. In nearly every instance the skier will be safer if the pole is lost. Catching a pole that is attached to the wrist is a frequent cause of shoulder dislocations and hand and wrist injuries that would not normally occur were the poles not attached to the skier.

Contrary to the situation of runaway skis, the temporary loss of a pole does not significantly increase the danger of skiing. Indeed, many expert skiers never use the straps.

SKI INJURIES

Ski injuries usually are merely nuisances, forcing the skier to take off a few days from skiing. Even the more severe injuries do not deter skiing for more than a week or two for one half of those concerned.

Cuts, scrapes, and bruises account for about one sixth of the reported injuries. After appropriate first aid, many of these injuries will permit further skiing on the same day.

[2] William Haddon, Jr., Arthur E. Ellison, and Robert E. Carroll, Skiing injuries, *Public Health Reports* 77 (Nov. 1962), no. 11.

Approximately one half the injuries involve sprains and strains. Most of these injuries should be examined by a physician.

The remainder of reported ski injuries involve fractures. The terms "fracture" or "broken bone" elicit visions of months spent in plaster casts and the cessation of further skiing. The fact is that almost all skiers suffering fractures will be able to ski safely the following season. The decision regarding subsequent skiing must rest with the physician.

Although the subject of fractures is always discussed in articles dealing with ski safety, the rate of occurrence of a fracture while skiing is about once for every 42 years of average pleasure skiing — hardly an ominous incidence.

SAFETY OUTLINE FOR A GROUP SKI TRIP

A. The Ski Trip Leader
   1. He must be officially recognized by the institution sponsoring the trip.
   2. He must be given the authority to discipline.
   3. He must be a skier.

B. Choosing the Ski Area (see conclusion of section)
   1. Is the ski patrol adequately staffed and equipped?
   2. Are instructions for lift and tow use readily available?
   3. Are lift operators available to assist the uninitiated skiers in the use of lifts and tows?
   4. Are slope grooming methods used (especially in the novice areas)?
   5. Are maps (individual) or map signs available to help acquaint the skier with the various slopes and their difficulty?
   6. Is the universal system of trail markings used? If not, what system is used?
   7. Does the area have a ski school directed by a certified ski instructor?
      a. Is there an adequate number of instructors to accommodate the group?
      b. Are classes (especially novice) conducted on a slope reserved for exclusive use by the ski school?
   8. Does the area provide facilities for locking ski equipment when it is not in use?
   9. Is there a physician practicing at the ski area?
      a. If not, where (how far) is the nearest physician?
      b. Where (how far) is the nearest hospital?
      c. Does the ski area provide ambulance service?
   10. How long will it take to drive to the ski area? What are road conditions likely to be?

C. The Classroom Session

   (This event should take place approximately one week prior to the ski trip. This will allow time to buy, re-install, or repair equipment.)
   1. Attendance should be mandatory for all who will attend the trip.
   2. Check all bindings for adequate functional installation (see section on bindings).
   3. Adjust bindings (see section on bindings).
   4. Check all skis for devices capable of preventing runaway skis.
   5. Discuss ski courtesy.
      a. Stop only at sides of slopes or trails, never in the center.
      b. Wait your turn in lift lines.
      c. Always look uphill before coming onto a slope or trail.
      d. Never pass too closely to other skiers.
      e. Call "track left," "track right," "on your left," or "on your right" before passing another skier.
      f. Fill in sitzmarks.
      g. Don't litter the ski area.
      h. Follow all posted instructions ("closed" slopes, etc.).
      i. The golden rule applies in skiing too.
   6. Discuss (and show examples) of the trail markings that are used at the area.

7. Encourage skiers to purchase locks for their skis and poles, or, if skis are not locked, stand one ski and pole away from the other.
8. For novice and beginning class skiers, have an instructor give a brief classroom lesson on fundamentals (the principles involved in skiing, what manuevers will be taught, and why they are taught in the progression that they are, etc.).
9. Determine if any skiers have medical problems or healing injuries. These students should have a written consent to ski from parents and/or physician.
10. Discuss fundamentals of ski equipment care.
    a. Boots
        i. Keep polished.
        ii. Store in boot tree (keep soles flat).
        iii. Be sure toe of sole is not irregular or damaged.
    b. Skis
        i. Keep edges sharp and regular.
        ii. If wood. store in retain camber.
    c. Bindings
        i. Tighten all mounting screws.
        ii. Lubricate moving parts with silicone lubricant.

D. Getting to the Ski Area
1. All cars should be driven by licensed, competent drivers, able to drive confidently on ice and snow.
2. Students should be told when and where to meet on arrival at the ski area. At that time *not* prior to arrival at the area, they should be given their lift and ski school tickets.
3. Vehicles should contain an adequate number of blankets and other emergency equipment (chains, box of sand, flares, windshield scrapers, full gas tank, etc.) consistent with potential weather hazards.
4. Departure should allow time for reasonable driving speeds, possible hazardous driving conditions, and heavy traffic.
5. A car (preferably a station wagon) should accompany the bus. This is an *absolute necessity* if the ski area does not provide ambulance service.
    a. The car should contain at least two blankets, and an empty seat.
    b. The car should be equipped for winter driving (i.e., chains, flares, maps, etc.).
    c. Upon arrival at the ski area, the driver of this vehicle must be available on 10 to 15 minutes notice. The best solution is for the driver not to ski; attempting to find a driver somewhere on the ski slopes is a time consuming and frustrating experience.

E. Arrival at the Ski Area — Preparing to Ski
1. Be sure skiers are dressed appropriately for the weather. Do they all have gloves or mittens, parkas, sunglasses? Clothing never should be loose fitting.
2. Do all skiers have their runaway preventive devices?
3. Spot check for proper binding installation and adjustment.
4. Discuss the ski area layout.
    a. Use large, painted map signs or individual maps provided by the area.
    b. Discuss expertise indicated by trail markings in that particular ski area (e.g., what does "most difficult" mean at that area as compared to other areas where the students might have skied?).
    c. Point out (on map):
        i. Closed areas
        ii. Location of emergency telephones or other devices used for summoning help
        iii. Location of first aid room
        iv. Location of ski school meeting area
        v. Location of rest rooms
        vi. Location of warming facilities
        vii. Area where group will meet at the conclusion of skiing for the day. Indicate the exact time this meeting will take place.
5. Tell skiers how and where the supervisor can be reached *at any time*. (It is not enough to advise skiers about notifying the ski patrol to find the supervisor. It is

the *responsibility* of the supervisor to be constantly and readily available.)

6. Be sure all skiers know the supervisor's name.
7. Be sure all skiers know how to notify the ski patrol.

F. Skiing
   1. Most students, especially novices, will enjoy and learn more if at least the morning is spent in ski school.
      a. Ski school will offer levels of instruction consistent with the skiers' abilities (if the area was chosen properly).
   2. If an injury occurs, the following steps should be taken:
      a. When there is any doubt regarding the severity of an injury, or when skiing, walking, or standing is painful, the ski patrol should be called to transport the skier off the slope.
      b. The injured skier *must* wait in the first aid room until the supervisor arrives.
      c. The injured skier must be examined by a physician.
      d. Skiers should be encouraged to seek aid for all injuries — even those which appear minor.

A SERVICE FOR ORGANIZED SKIING

National Ski Safety Research is a nonprofit organization which studies and promotes ski safety. It receives no financial support from any facet of the ski industry. National Ski Safety Research offers an advisory service to organized ski groups. Representative of information it gathers from ski areas are:

1. Tow ticket costs
2. Maximum height of area's slopes
3. Maximum length of slope as well as average length of slopes of varying difficulties
4. Proportion of beginner, intermediate, and expert slopes
5. Trail marking system used
6. Presence of a ski school
   a. Directed by a certified ski instructor
   b. Total number of instructors
   c. Proportion of certified to noncertified instructors
   d. Cost of lessons
7. Ski patrol
   a. Number of paid professional patrolmen
   b. National Ski Patrol System affiliation
   c. Number of patrolmen (weekdays and weekends)
   d. Equipment in use
8. First aid facilities
9. Area sponsored ambulance (including cost and method of payment for services)
10. Presence of a resident physician
    a. Nearest physican and hospital

National Ski Safety Research will, in addition, critique the above information and indicate the existence of factors not readily apparent that might encourage or deter use of the area for ski trips. The critique will also consider reports obtained from previous groups.

Information about this service can be obtained from National Ski Safety Research Group, 126 Cresta Rd., Colorado Springs, Colo. 80906.

Sledding | CARL W. MOEN

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Safety in sledding covers a wide area — from the popular sledding on small inclines or hills to the highly specialized bobsledding in Olympic competition.

Safety for a child on a sled depends largely on adult supervision. Parents should join their children in the activity; if this is not possible, some type of supervision must be provided. The uncontrolled sled can be a lethal weapon in the hands of youngsters.

Because of the speed element bobsledding has inherent dangers, thus the risk of injury is unavoidable. Standby first aid and medical assistance are provided as a matter of course. Ambulance service is always ready to rush the more severely injured to the hospital.

Speeds of the bobsled in competition can spell disaster at any moment. It is this thrill factor that provides spectator appeal, offering the excitement of the mad flight downhill.

ORGANIZED AND UNORGANIZED PLAY

Winter recreational sports are either organized or unorganized. Safety in organized sports is generally insured through well developed sports programs as attested by the supervised recreational areas maintained by city and municipal governments, public schools, colleges, and professional sports organizations.

Child's play is often unorganized and unsupervised. Sledding belongs to this realm of unorganized play. Children use their sleds in vacant lots and on hills or inclines and quite often the course leads to intersecting streets. In most residential localities there are some areas for organized play. If not, the parent must assume the responsibility and structure his child's activities, for children on their own are usually oblivious to potential hazards.

Sledding

Suggestions for the promotion of safety in sledding are the following:

1. Provide supervision, personal or otherwise, for children sledding.
2. Select an area safe from cars.
3. Eliminate courses that cross street intersections.
4. Chart courses as free of trees and other hazards as possible.
5. Acquaint the children with the course.

6. Check ice for safety if the slide ends on a pond or lake.
7. Teach the children to watch out for sledders returning uphill.
8. Teach children the danger of straying off the course and running into fixed objects.
9. Do not allow overloading.
10. Check sleds for splinters and other unsafe features.
11. Do not permit sledding at night unless there is adequate lighting.

The sport of towing sleds and toboggans behind automobiles is extremely dangerous and should be discouraged. The added thrills are not worth the risk of the tragic accidents that can result.

Tobogganing

The toboggan can be considered in the same category as the sled. Originally a utility vehicle, the toboggan soon gained popularity in the field of recreation. It proved to be more versatile than the sled for it lent itself to coasting in the mountains on most ice or snow covered terrain. It is best known as the forerunner of the bobsled. In terms of safety, there is an element of danger associated with the toboggan, but it is negligible if ordinary common sense safety rules are observed.

Bobsledding

Bobsledding was introduced as a recognized winter sport at the First Winter Olympics in 1924. Because of its speed factor and precise navigation, danger and bobsledding are practically synonymous. Speeds upwards of 100 miles an hour have been obtained in this thrill-packed sport, which requires a high degree of skill and split-second timing. Because bobsledding does not permit a single mistake, excellent physical condition of the participants is a must. The excitement of the run and the thrill of unthrottled speed, the whip of the wind and the challenge of competition all make it a top sport for the hardy souls who follow it.

Fortunately, bobsledding in the Olympics is designed only for highly qualified entrants. Its demands in terms of reaction and performance parallel those placed on a jet pilot aboard an aircraft carrier. It is an exciting sport with great spectator appeal and danger, but it is no particular friend of safety. It is a sport only for those who dare.

Safety apparently is of little consideration in some of the Winter Olympic events. There is a sport called luge (rhymes with huge) which is the epitome of recklessness and a total disregard for life or limb. Luge can be a one-man or two-man event. In the one-man event the participant lies on his back on a toboggan or two-runner sled and negotiates the icy chute, using his feet to steer in speeds up to 70 miles per hour. In the two-man event one man lies atop the other. From the standpoint of safety, luge defies all convention and presents a scene of utter and complete mayhem.

Ice safety in winter sports will assume greater significance in the future. It is estimated we will have twice as many people, twice as much income per person, 1.5 times as much leisure, and nearly twice as much travel in the year 2000 as in 1960. Translate this into terms of recreational demand and we must find new playgrounds, one of which will have to be a winter wonderland for sledding.

Safety is a code for living. While safety must never become a fetish that will deny both young and old the pleasures of outdoor recreation, it should, nevertheless, be the guiding principle for steering the behavior of participants in sledding, as in all sports.

Iceboating | CARL W. MOEN

45

Originating approximately 400 years ago in Europe, iceboating, or yachting, is our fastest winter sport. Iceboating is strictly an amateur sport. Its devotees find the thrills of racing and the battle with wind and speed sufficient to compensate for the lack of plush purses and championships for glory. It is a selective sport followed by a relatively hard core group of participants.

Generally there is no license to pay, no expensive maintenance, no speed laws, no gas to buy, no fee to enter the course, and only nature to contend with to power your craft. There is only one limiting factor to iceboating — *safety*. The greatest concentration of iceboating is in the United States, specifically, the Northeast and Midwest from Maine to the Dakotas.

Kinds of craft

Iceboating has been popularized by the introduction of new boat models which are small and inexpensive. The 75 sq. ft. Sketter and the DN-60 are typical of these small boats. They are safe, easy to navigate, and turn on a dime. Homemade boats cost $250 and up, ready-made about $500, and the large skeeters cost $2,000 or more. Class A boats, popularly called "Big Daddies," with 350 sq. ft. of sail, pose special safety problems when underway because of their awesome power and speed.

Safety rules for iceboating

1. "Hiking" (stunting on the ice) is for the proficient; it is not for the novice.
2. "Skinning" (just trying to miss another craft) is foolhardy.
3. Conduct a trial run of your course at reduced speeds to check the ice, drifted snow, or other hazards.
4. Observe the same rules of the road on ice as you would on the highway.
5. Too much speed for the beginner in iceboating invites disaster.
6. Carry liability insurance on your ice craft.
7. Use common sense in all your iceboating and abide by established practices.

Dress and equipment

Thermal or woolen underwear, windproof outer garments, gloves that are both warm and flexible, and footwear for both warmth and footing are essential in this sport, which seems to raise temperatures to a wind chill of Arctic proportions. Also, goggles, face masks, and for racing, crash helmets, are necessities. In addition, iceboaters wear insulated underwear, dacron jumpsuits, sheepskin mitts, welder's helmet liners (liners have a protective face mask), surplus Marine flyer's helmets, in fact, nearly everything they can put their hands on. Ice yachts should carry emergency boxes containing extra clothing, a first aid kit, rope, and other miscellaneous items. Sealed compartments which insure flotability should be installed in the craft. Safe equipment is a must.

Speed and safety

Speed varies with the type of craft. A good iceboat with a wind of 15 to 20 mph will travel 75 to 100 mph. For the amateur, 50 or 60 mph is easily attained; for the professional on larger yachts, speeds soar to 120 and 130 mph. Speed also varies with the weather. The hard-water sailor glories in a brisk wind of 20 mph, temperatures well below freezing, and unlimited smooth, clear ice. On the other hand, there are times of little wind and mild or melting temperatures that stalemate the iceboater.

Because of the speed factor in iceboating, the operator's expert judgment and skill become crucial elements of safety. It has been said that the best protection offered iceboaters from the careless operator and the inept beginner is the dispersion of craft over large and almost unlimited expanses of ice. Unlike the automobile, there are no lanes to follow and traffic is seldom, if ever, congested.

No man has the right to court danger or endanger the lives of others on the ice. Horseplay, "skinning" (trying to just miss another craft), and other acrobatics that threaten control of a craft and jeopardize the lives of others are indefensible. Laws for regulation and adequate policing are needed on many lakes in winter. In some areas patrols have been established.

Hiking

Stunting with your craft while careening over the ice on two of three runners is dangerous because of the possibility of a strong gust of wind flipping the craft over and snapping the mast. If done at all, stunting should only be performed by an expert skipper; it can be a beautiful maneuver and an added thrill to spectators. In racing, stunting is not practiced for it reduces speed.

The ice course

Any sport involving speed requires greater than average alertness and attention to operation. Iceboating is no exception. Know the ice expanse on which you are operating — snow that may have drifted, the ice that may have cracked and heaved, open water caused by springs or thermal pollution by industry, and any natural or artificial barriers that may exist. Before high speeds are attempted, a trial run or reconnaissance is required for safety.

Speed is the principal hazard in iceboating. It can be the critical element in an iceboat going out of control and running ashore; striking a snow drift or a hidden object on the ice; colliding with another craft; or hitting a hapless skater or a pedestrian afoot on ice. The good boat operator, just as the good automobile driver, anticipates danger and practices defensive driving.

Ice Fishing | CARL W. MOEN

46

Ice fishing has become a popular winter sport and it has a growing number of followers. The sport may take the form of angling through the ice with no shelter, angling in a fishing shack, or spearing.

In the early days of ice fishing the principal drawback was the chore of chiseling a hole through the ice. This in itself was not too bad, but as it was time consuming it limited travel, and fishermen love to move. Today, power (gasoline or electric) augers make fast work of tnis tedious job.

Angling or spearing in a fishing shack or house has one big advantage — shelter from the wind and cold. A relatively large hole is cut in the ice, possibly two feet by three feet, depending on the fisherman. It gives a fascinating view of the world below. For the angler it provides the added thrill of watching the fish approach the bait. The dark house fisherman may watch the fishing drama in up to 20 feet of water.

Ice fishing safety

Safe ice fishing begins by sizing up conditions on a lake before carting fish shacks and other paraphernalia onto the ice. A good place to start checking a lake is around shore. If the shoreline seems fragile, squashy, or broken up, it is a good indication that the lake is unsafe. One cannot always tell the strength of ice simply by its appearance, its thickness, the temperature, or whether or not it is covered by snow. However, new ice is generally much stronger than old ice; in fact, a few inches of new, clear ice may be strong enough to support a person while a foot of old, honeycombed ice will not. Four inches of new ice is considered the minimum for safety.

Beware of the following: inlets and outlets to lakes; areas in spring-fed lakes that have thin patches of ice; dark spots in the ice or places where the snow looks discolored; water areas or rivers where the ice may be weakened from the release of warm waters (thermal pollution from industrial plants and sewage disposal units); and all ice during freeze-up time and the spring thaw.

Don't trust honeycombed ice — it can be treacherous. Also, special conditions often create unsafe ice. For instance, in the winter netting of certain fish, such as whitefish (legal in some states), the constant movement of a large catch of fish will wear ice paper thin between the stakes holding the net.

Travel on ice

Driving cars on ice is dangerous at any time. If one drives on ice he should leave safety belts unbuckled, keep the doors open, and be ready to jump out. If vehicle stays afloat, the driver should try to knock out rear window and crawl out. However, if he disregards all these precautions he may still survive, as did one man who in his car plunged through the ice and 20 feet of water to the bottom. This man was a good swimmer. He did not panic — he waited for the water to seep into the car to relieve the pressure on the doors, then went out and up with his eyes open. He is alive and well today, thanks to his ability to swim and perhaps luck. Knowing how to swim is possibly the best protection one has if he goes through the ice.

When fishing from a darkhouse, be sure of proper ventilation, whether it be a simple hole in the roof or a regular stove pipe. Danger exists for fishermen who use small burners and similar heating devices which lack some type of venting for escaping fumes. Carbon dioxide may make one feel uncomfortable, but carbon monoxide is a silent killer.

On the more populous lakes an extra hazard to ice fishing is introduced — the landing of the ski plane. Because of its speed, the ski plane can be a danger especially when visibility is poor. Most state air patrol agencies designate certain lakes for landings. In future years, with increased population, lake use may require rigid regulation.

The following code should be followed by ice fishermen:

CODE OF SAFETY ETHICS

1. Learn to respect ice.
2. Know your lakes.
3. Know the vagaries of ice.
4. Beware of early freeze-ups and the spring thaw.
5. Dress for all kinds of weather.
6. Respect the rights of other fishermen.
7. Help others in distress.
8. Observe the law on littering and pollution of lakes.
9. Obey the game and fish laws.
10. Be a sportsman in all respects.

Figure 1. Proper clothing is essential.

Cities on ice

Cities on ice create an entirely new problem for ice safety in winter fishing. A classic example is Mille Lacs Lake in Minnesota. This city averages 5,000 fish houses annually, which does not include outside fishing through the ice. This setting approximates a city with a population of 10,000, and poses a parking problem for two or three thousand cars.

Imagine a city of this size with relatively no police protection, no rescue squads, no formal city ordinances, no curfew, no communications system, no ambulance service, no sewage disposal system, and no city government.

Recreational demand and ice safety

Water, in one form or another, has the greatest potential for recreation of all our resources. An acre of water has a far greater potential for recreation than the land surrounding it. Land must contend with the encroachment of industry, highways, cities and suburbs, summer cabins, and estates and private hunting preserves to mention only a part of the land acquisition program today.

Predictably, population pressures will catapult ice and water into a popularity undreamed of yesterday or even today. Winter sports, a multimillion dollar industry for many states, is conservatively a billion dollar industry for the nation. It is slated to double and triple in the years ahead. Ice, water, and snow constitute our last recreational frontier.

Ice fishing is a democratic sport because anyone can engage in it: age is no factor, young and old may participate, the handicapped are not barred, and there is no color or creed barrier. With such a large following, ice fishing crucially needs an expanded ice safety program, the cooperation of many agencies including law enforcement (local and county), conservation officers, and even our public schools.

Snowmobiling | HENRY V. ZIMINSKI, B.S.

47

The growth in the use of snowmobiles is dramatic. In 1968 more than 225,000 snowmobiles were in use, compared with only 8,000 in 1964.[1] There are between 300 and 400 active snowmobile clubs in existence.

Snowmobiles have a wide appeal. For winter recreation they are used for ice fishing, hunting, cross-country touring, camping, skijoring (a sport in which a vehicle draws a skier over ice), rallies, and racing. The family is a most important segment of users. Age and poor physical condition need not be a deterrent. Even those who lack stamina for skiing, or who are physically handicapped, can enjoy snowmobiling in certain circumstances.

The appeal of the snowmobile is its ease of operation, its speed, and mobility. Depending on engine size, stock models of snowmobiles are capable of speeds up to 50 miles per hour. Racing vehicles can travel much faster. Such speeds enable operators to travel long distances into isolated country in a short time.

To facilitate enjoyment of the sport, land management agencies administering county and state forests and parks, national forests and national parks, and industrial forest ownerships have designed and laid out many miles of trail. A uniform trail signing system is being worked out cooperatively by the Bureau of Outdoor Recreation, Forest Service, National Park Service, state agencies, and manufacturers' representatives. To provide a safer sport, public agencies have also adopted a safety code and code of ethics, which are being disseminated in brochures and operators' manuals.

HAZARDS

Hazards of this sport can be grouped into three classes: the machine, the terrain, and the sport participants.

THE MACHINE

Snowmobiles are well engineered machines. Though they are deceptively simple because of small size and ease of operation, the snowmobile demands the respect of a complicated machine.

Snowmobiles have a tendency to tip on rough terrain and side hills. Their open construction

[1] Stewart L. Udall and Orville L. Freeman, Secretaries of Interior and Agriculture, Joint news release commending sponsors of a code of ethics and safety (USDA 279-68, Jan. 25, 1968).

makes riders vulnerable to injury from collision or low hanging branches.

Snowmobiles can tow toboggans or trailer sleds designed for hauling supplies or extra passengers. The safety designed trailers have rigid tow bars to prevent tailgate collisions and to provide better control on turns. Unlike car brakes that depend on pavement for friction, snowmobile brakes are not designed for sudden stops.

The terrain

Snowmobiles travel best in flat terrain. While they can go over short pitches, they are incapable of traveling over long, steep hills.

Deep snow will mire a machine, requiring considerable physical exertion to free it. Snowmobiles, like all machines, are subject to breakdowns. Inability to perform repairs or to find one's way through isolated country may leave passengers vulnerable to the effects of exposure.

Snowmobiling is done in a variety of environments: urban and rural areas; open fields and forests; over flat and rough terrain; and in isolated country. Snowmobilers are found on unplowed roads, mountain valleys, and frozen swamplands, rivers and lake surfaces. The sport is popular at night, as well as during the day.

One factor common to all snowmobiling is cold weather. Rapid speeds expose passengers to high wind-chill factors and the danger of frostbite. For example, a snowmobile traveling 30 miles per hour when the temperature is 10° exposes the passengers to a wind-chill temperature of —33°.[2] Machine breakdowns in deep snows make walking impossible unless passengers are equipped with snowshoes or skis. Spending the night under survival conditions is a possibility but in many mountain valleys there is danger of avalanches. Also, unexpected snowstorms may cause a group to become lost.

Ice travel is one of the most hazardous of all snowmobile operations. Moreover, most snowmobile fatalities have been drownings as a result of machines breaking through the ice.[3] Slush will stop a machine faster than deep snow.

Snowblindness, another potential hazard, is caused by the glare of sunlight on snow. This danger increases in late winter months when thawing leaves a glaze on the snow.

The users

Snowmobilers can be a hazard to themselves as well as others. Some dangerous practices include operating machines at speeds excessive for the terrain; failure to recognize hazards and heed warnings; and permitting children to operate machines without adequate supervision or instruction. Also, inadequate first aid training and supplies can complicate injuries which might occur.

Do not risk insufficient preparation for a trip by failing to obtain adequate maps, a compass, information on conditions concerning the planned route, and failing to notify others of intended route.

HAZARD REDUCTION

Snowmobiling is less than 10 years old, and there is already a growing concern over the increasing number of accidents and injuries. Newspapers have reported collisions involving one or more snowmobiles, snowmobiles and cars, and even snowmobiles and such animals as horses. Arm and leg injuries resulting from such accidents have been numerous. Several drownings have been reported annually, resulting from machines going through ice, and usually involving multiple deaths. Avalanches have also accounted for several deaths.

Snowmobile operators can do little to change the terrain and weather, but by taking necessary

[2] United States Army Wind Chill Index Table.

[3] National Safety Council, Meet the snowmobile, *Family Safety* 26 (Winter 1967), p. 14.

precautions they can minimize hazards and injuries.

THE MACHINE

Snowmobile designers are concerned with safety. Despite engineered simplicity of control and handling, however, basic owner training is necessary for safe operation. At present this can only be obtained from field practice and study of owners manuals. Operators should know as much as possible about mechanical operation, and should be able to perform minor repairs or adjustments.

Know the limitations of a snowmobile under different field conditions, its capability in different types of snow and snow depths, its turning characteristics, and what precautions are necessary for side slopes and rough terrain. Know the cruising range of the machine and provide extra fuel. Users must realize that by covering long distances in a short time they will soon be in isolated country and thus victims of the weather if engine failure occurs.

Through continued self-training, operators can become thoroughly familiar with all aspects of machine controls and safety features. Only through study of owners manuals and field experience can proper operating techniques be learned for travel in various types of terrain and snow conditions.

Common sense should be used at all times. Hot-rodding and jumping is for specially trained and experienced racers. Control of the machine is a primary necessity. Excessive speed can result in upset or collision with other vehicles or objects. Reduced visibility at night calls for slower speeds.

Parents must be the judge of their children's ability to understand and control the tremendous power of a snowmobile. Parents have the responsibility to train youngsters in safe operation of the vehicle and must instill a sense of responsibility in them.

Many safe automobile driving practices are applicable in snowmobiling. These are: maintaining safe distance between machines; reducing speed in making turns; and making a cautious approach to highway crossings or other trails. Driving in highway rights-of-way open to traffic is not encouraged, particularly at night when auto drivers can be confused by snowmobile headlights.

TRIP PLANNING

For long trips or overnight camping trips, several precautions are suggested. A definite travel route should be planned. Family, friends, or other concerned parties should be informed of intended route and the time of expected return. Obtain maps of the territory for which the trip is planned, as well as information on trail locations, avalanche hazards, and where unsafe ice or slush conditions can be expected. Travel over lakes and streams only when certain that their surfaces are safe. On long trips, the "buddy system" of two or more machines is advisable. Advanced weather forecasts are essential to reduce the chance of isolation because of storms, and to determine expected wind-chill temperatures. Whenever possible, someone trained in first aid techniques should be in the party.

Figure 1. A wise precaution on long trips is use of the "buddy system."

Equipment and supplies

An emergency tool kit is a necessity. Recommended basic components include extra spark plugs, extra drive belts, plug wrench, pliers, screwdriver, friction tape, flashlight, owners manual, and towrope.

Other essentials include a compass, matches in a waterproof container, axe, extra fuel, snowshoes or skis for each passenger, dehydrated emergency rations, a small kettle, space type blankets, and a small tarpaulin. A lightweight block-and-tackle to free machines stuck in deep snow could save a life.

Clothing

A most important factor in enjoyment of snowmobiling is adequate clothing. Good quality thermal underwear is essential. Outer clothing should be light, windproof, and flexible so as not to impede movement. A wool shirt under an insulated windbreaker jacket, along with wind resistant wool or insulated pants, make a good combination. Special one-piece suits designed for snowmobiling are appearing on the market.

Thermal boots, or leather-top rubber pacs with felt inner boots, and two pairs of socks are excellent for keeping the feet warm. Fleece lined, insulated leather mittens, or deerhide choppers mitts with wool liners are better than gloves.

Use a warm cap for head protection. For extreme cold, a wool face mask should be worn. Tinted, shatterproof goggles reduce glare and are effective in cold weather operation Travel through heavily wooded areas may require a safety helmet to prevent head injury. Plastic shields and visors are not recommended because breath moisture obstructs vision.

Survival precautions

Becoming lost or experiencing equipment failure can require persons to spend a night outdoors under severe conditions. Don't panic, is the first rule. Keeping warm is crucial; a plentiful wood supply and the ability to light a fire are essential. Wind shelters of poles and evergreen boughs can be built to break the wind. Food and energy should be conserved. Walking out at night should not be attempted, even if snowshoes are available.

References

Brisbois, Elmer. Snowmobile safety tips. *Snow Goer* 2:16, Fall 1967.

How to Organize for More Winter Fun. Milwaukee, Wisc.: Evinrude Motors, Inc., c. 1967. 12 pp.

International Snowmobile Industry Association. *How to Organize Local Snowmobile Clubs*. Minneapolis, Minn.: The Association, 1966. 23 pp.

———. *The Wonderful World of Snowmobiles*. Minneapolis, Minn.: The Association, 1966. 6 pp.

Maxam, June. Snowmobiling: New family sport. *Better Camping* 9:18-21, Febr. 1968.

National Safety Council. Meet the snowmobile. *Family Safety* 62:12-14, Winter 1967.

———. *Play Safe with Snowmobiles*. Chicago: The Council, 1969. 13 pp.

Snow Cruising Handbook. Milwaukee, Wisc.: Evinrude Motors, Inc., c. 1967. 23 pp.

Snowmobile Safety. Milwaukee, Wisc.: United States Department of Agriculture, Forest Service, Eastern Region, c. 1968. 6 pp.

SAFETY IN OUTING ACTIVITIES

Fishing | JULIAN W. SMITH, Ed.D.

48

Fishing is one of the most popular outdoor sports. The simplicity of equipment and relative solitude of lakes and streams in America offer a safe and relaxing sport for millions of people. Most of the potential fishing hazards are related to a lack of swimming skills and improper use of boats, especially motorboats.

FISHING IN BOATS

Regardless of life jacket equipment, fishermen using boats should have sufficient skills to swim fully clothed. While most accidents in and on the water result from carelessness, slippery boat bottoms, or overloading, there is always a possibility of sudden storms and boat collisions.

Many of the safety precautions relating to boats are discussed elsewhere in the section. However, since most fishing accidents involve boats, some of the accident causing situations are described here.

Moving about in a boat. Unexpected movements due to excitement, landing fish, or casting an anchor may cause boat occupants to fall overboard or capsize the craft. If it is necessary to stand to keep a line from fouling, the fellow fishermen should remain seated to keep the boat on an even keel. When moving forward to hoist anchor one should step on the bottom amidships, not on the seat. The body should be kept low with one hand on the gunwale. Care should be taken in hoisting the anchor when it is fouled in weeds or mud to prevent water from coming in over the sides.

Standing in a boat is always risky, especially in rough water or when trying to get unhooked after a bad cast. There is always danger of the boat hitting a snag or of having the motor thrown accidentally into reverse.

Operating the motor. Stepping into a boat while holding a motor may cause loss of balance or the dropping of the motor. The motor should be on the dock edge before entering the boat; then, with feet apart, it may be swung into the boat and over the transom. When pulling the starter rope, the operator and all other persons in the boat should be seated. Hard to start motors need to be checked by servicemen to guard against engine failure; such a breakdown could be tragic in storms or darkness. The operator should never use the motor as a seat. When the boat is running at full throttle, boat occupants should be watchful for rocks, snags, and floating debris.

Fishermen using motorboats on larger bodies of water should have full weather information. If a storm threatens while the boat is out on the water, the operator should return the boat to shore immediately.

Safe boats and needed equipment. Boat manufacturers use a standard formula for setting a safe capacity, which is usually displayed on a permanent transom plate. Heed total load rating, not only persons, because the weight of motor and gas can exceed the weight of one person.

The Coast Guard, as well as most states, requires a life preserver or buoyant cushion for each occupant in a boat. Many fishermen do not use life preservers because they are hot and bulky, and rely instead on cushions. Weak swimmers, however, should not depend on cushions, but should use a life preserver at all times.

Caution must be always exercised around gasoline. Do not smoke when refilling and be careful when wiping spills.

Drinking liquor is no more compatible with the operation of a motorboat than with an automobile.

Use of fishing tackle

Hooks rank second to boats as causes of fishing accidents. Improper form, such as sidearm casting when there is more than one person in the boat, is the chief cause of accidents with lures. Overhead casting is not only safer but is more accurate. However, any form of casting

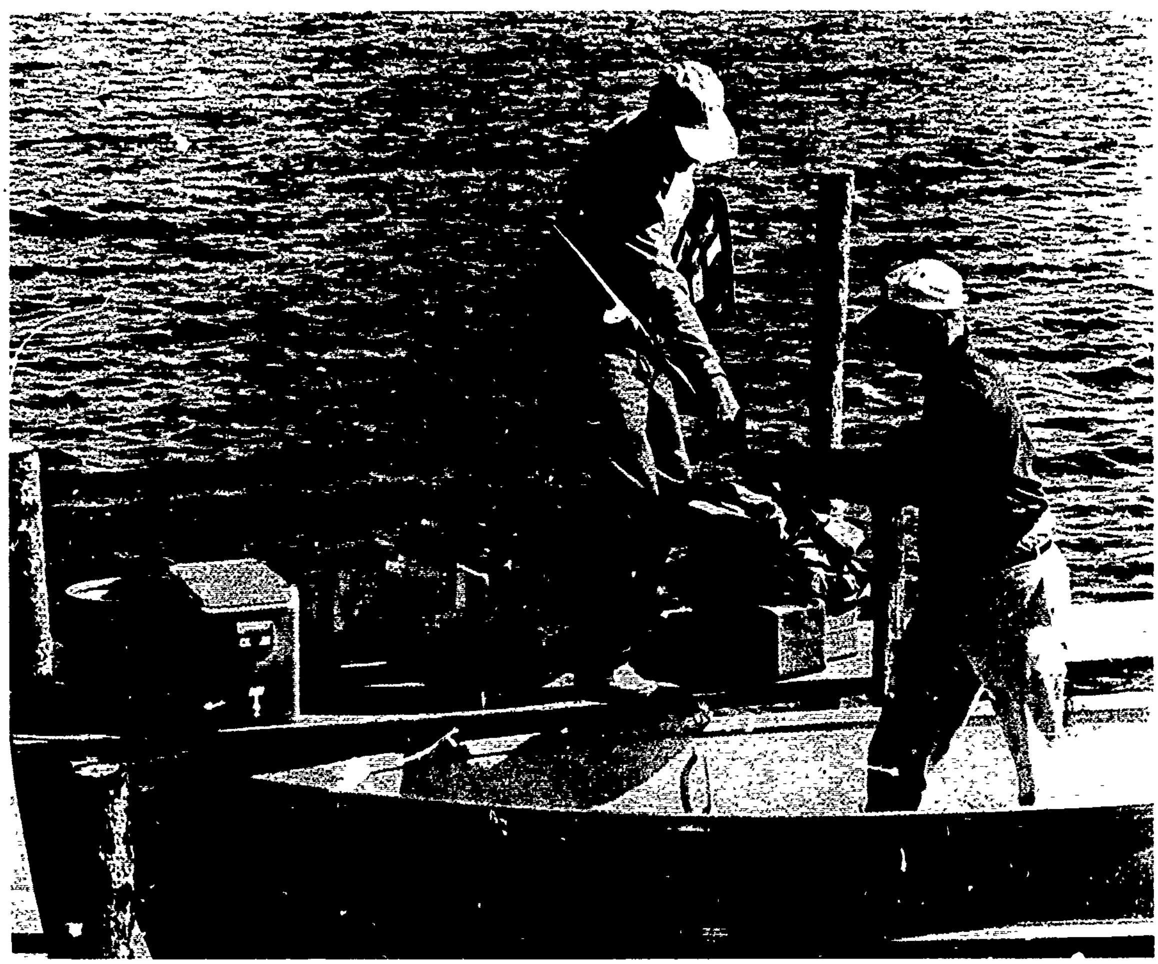

Figure 1. Trim your craft to stay afloat.

can cause accidents when the backcast is in the direction of other boat occupants. The proper form is to cast at right angles from the boat.

When removing weeds or changing lures, release enough slack line so that it is not under tension. A bowed rod can snap a hook into a finger or other part of the body. Side cutters should be a standard item in every tackle box. In the event a hook penetrates past the barb it should be pushed through the flesh so that the barb can be removed with the side cutters. A wound caused by a hook should be treated with antiseptic, another important item for a tackle box.

Handle fish carefully, especially those with sharp teeth and fins. Some fish, such as muskies, should be stunned with a club before gaffing or immediately upon being brought into the boat. Long nosed pliers, an important tackle box item, are useful in removing gang hooks from fish.

Stream and bank fishing

The main danger in stream fishing is wading in water of unknown depth, especially when the fisherman is wearing boots and heavy clothing. Slippery stones and logs are also hazardous.

Ice fishing

The increasing popularity of ice fishing has created a need for safety procedures, especially for those with little experience on frozen lakes and streams. An ice fisherman should always check ice for strength and thickness. Four to six inches of solid ice is sufficient for a few fishermen in a small area, but is not enough for *fish shanties* or for driving cars on the ice. Fish shanties are small, crude structures, such as a tent or wood shack, which fishermen set up on the ice to protect themselves from the cold and wind while they fish. Using cars on ice is recommended only in very cold climates where the thickness of ice is measured in feet instead of inches. In all ice fishing, fishermen should stay a safe distance from open water, inlets and outlets, and springs.

Ice fishermen should not leave debris on ice which later in warm weather could cause danger in swimming and boating areas. Fish shanties must be removed from the lake or stream before the ice becomes unsafe through melting. When fishing in a heated ice shanty, check for proper ventilation. Homemade heaters are dangerous because of their fumes and fire.

As with other sports, the best safety guarantee in fishing comes through developing competent skills. Important, too, is that fishermen constantly inspect their boats and tackle. Teaching casting and angling in schools and youth agencies can make fishing a safer sport. Local casting clubs also can further the goal of improving skills and safety in fishing.

Hunting and Shooting | LOUIS F. LUCAS, M.C.S., C.P.A.

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Hunting is one of the oldest outdoor sports. It has been practiced out of necessity or for sport since man first armed himself with clubs and stones. Today, it is among the most popular outdoor recreational activities. Recent reports indicate that nearly 14 million people bought 18 million different types of licenses in 1966.

Hunting and informal shooting require knowledge, skill, and judgment by those who would participate safely. Diminishing open spaces and increasing population have almost eliminated the places where a shot can be fired without the possibility of another person being within range.

HUNTING ACCIDENTS

Firearms accidents

Hunting accidents involving firearms fall into two types: those in which the gun is fired deliberately and those in which the gun fires accidentally.

Accidents stemming from a deliberately fired gun occur in different ways: the hunter shoots another person when he is firing at a moving target; the hunter mistakes another person for game; the hunter fires in the direction of a sound or movement without first identifying the source; a bullet ricochets; a bullet goes beyond the target and strikes an unseen person; the hunter fails to make certain that the gun was unloaded; the hunter uses the wrong ammunition or a faulty gun.

The gun can fire accidentally also in a variety of circumstances: the gun is faulty and fires when dropped or bumped; the hunter slips or falls and fires the gun unintentionally; the hunter has the gun completely ready to fire and the trigger is caught on a limb, barbed wire, or other similar object.

Bow hunting accidents

Hunting accidents with archery tackle parallel those with firearms since, in both cases, the hunting instrument shoots a projectile. Bow hunters are subject to the same mistakes in judgment as hunters who use rifles and shotguns. The arrow ricochets or goes beyond the target and strikes an unseen person. The bow can also shoot its arrow accidentally. The arrow is carried in the cocked position with tension on the bowstring. The hunter's fingers slip. The bow is faulty. There is one additional hazard in archery hunting equipment that does not figure in gun hunting equipment. The projectile is hazardous even when at rest. The bow hunter must treat his arrow in much the same way he would treat a handful of razor blades.

Statistics

Although statistics do not prevent accidents, they do provide information on how accidents happen and can guide in the designing of accident prevention programs.

Statistics on hunting accidents come from two sources, *Accident Facts* and the *Hunter Casualty Report*.[1,2] The former deals with the number of fatalities annually. The latter analyzes the types of accidents, conditions under which they happened, percentage of fatal and nonfatal accidents, ages of those involved, type of hunting arm, range, and other pertinent data. The Uniform Hunter Casualty Report Form defines a hunting accident as "a hunter casualty in which a person is injured by the discharge of a hunting firearm outside of the home and arising from the activity of hunting, including travel to and from the hunting field."

According to *Accident Facts*, there were 1,000 fatal hunting accidents in 1966; this figure includes some deaths (less than 5%) from accidents involving explosives such as dynamite.

The *1966 Uniform Hunter Casualty Report* analyzed 2,267 accident reports, of which approximately 13% concerned fatalities.[3] Shotguns accounted for 55% of the accidents. In 48% of the accidents, the victim was 30 feet or less from the gun. In 26%, the victim was 150 feet or less from the gun. Self-inflicted wounds accounted for 32% of the accidents.

More accidents occurred while rabbits were being hunted than while deer was the game. Squirrel hunters had the next highest number of accidents. The majority of hunting accidents occurred when the victim moved into line of fire; was covered when shooter swung on game; was out of sight of shooter; was mistaken for game; or stumbled and fell. Other accidents involved the following situations: clubbing cover or game; trigger caught on brush or other object; removing weapon from or placing in vehicle or boat; riding in vehicle with loaded weapon; weapon falling from insecure rest; "horseplay"; gun thought to be unloaded; crossing fence or other obstacle with loaded weapon; loading; unloading; defective gun; ricochet-stray bullet.

In the shotgun accidents alone, 38% of the shooters were 19 years old or younger. Interestingly, 39% of the victims wore bright, prominently colored clothing.

HUNTING EQUIPMENT

Accident prevention programs must concentrate on educating potential participants. These programs should teach what equipment to use, how to use it, to be aware of potential hazards, and how to avoid dangerous mistakes.

Any training program for accident prevention in hunting should influence the attitudes of the hunter. Unless the participant regards hunting as a game having rules of conduct which are as rigid as those controlling baseball, football, or basketball, his skills will be of little use to him.

A nationwide program of hunter safety training has been in operation for more than 15 years. In 40 states, the Game and Fish Department (or its equivalent) provides statewide hunter safety training programs with the cooperation of the National Rifle Association of America. These programs have trained almost four million hunters, predominantly young peo-

[1] National Safety Council, *Accident Facts* (Chicago: The Council), an annual publication.

[2] National Rifle Association, *Uniform Hunter Casualty Report* (Washington, D.C.: National Rifle Association), an annual publication.

[3] *Ibid.*

ple under 20 years of age. They have also become a part of the physical education curriculum in numerous schools and colleges.

GUNS AND BOWS

Hunting safety begins with a thorough knowledge of the implements. Popularity ranking of hunting instruments is as follows: shotgun, rifle, bow and arrow, handgun.

While rifles and pistols have barrels which differ in length, other characteristics are similar. The bore (the hole which runs lengthwise through the center of the barrel) has rifling in it. Rifling consists of a series of grooves which spiral from the breech (the place where the bullet comes out). These grooves cause the bullet to spin on its own axis and stabilize it in flight. The comparatively predictable course of a football which has a tight spiral as against one which does not is a common example.

The shotgun, on the other hand, has no grooves in the bore. This is because the shotgun is designed to shoot a number of shot (round pellets) at the same time and they spread out to make a pattern in flight. Also the wall of the shotgun barrel is considerably thinner than that of the rifle or handgun.

The action of a gun is that group of parts which carries the cartridge or shotshell into the chamber, fires it, and removes the fired cartridge case. Each action has a handle which the shooter can operate. In bolt action rifle, for instance, the bolt handle is used to open and close the action. Even semi-automatic actions, which insert a fresh cartridge and remove the used case after firing, have an external handle with which the shooter can open the action. Each action has an external projection by which it can be operated.

There are several actions which are common to hunting firearms. These are: bolt, lever, semi-automatic, hinge, slide (or pump). In each case the name describes the mechanical means by which the action operates. The bolt, for instance, locks shut and opens just as a door bolt does. The hinge action is most frequently found in shotguns. These guns "break" on a pivot, or hinge, at the breech end of the barrel. The breech is exposed and the shotshells are put in place by hand. When the gun is hinged shut, the shells are locked into the closed breech. The other terms bear the same relationship to the actions they describe.

Handguns are not commonly used for hunting. They are difficult to shoot accurately and their range is short. The two common types of handguns are the revolver and the semi-automatic. Again, the name is descriptive of the operation of the action. In a revolver, the cylinder revolves each time the trigger is pulled. The revolution of the cylinder brings a fresh cartridge into line with the barrel. When all cartridges have been fired, the empty cases are removed from the cylinder and fresh ones inserted in the chambers. Semi-automatic actions are common to handguns, rifles, and shotguns and operate in the same way. Every semi-automatic action requires a magazine, a receptacle that holds ammunition and feeds a fresh cartridge into the action each time the gun fires. With the magazine loaded and the action closed, the gun is ready to operate semi-automatically. Each time the trigger is squeezed, the gun fires; it does not fire continuously. It will not fire the fresh cartridge until the trigger is released and squeezed again. Part of the energy released by the burning power opens the action, ejects the fired cartridge case, and places a fresh cartridge in the breech. The gun is ready to fire again.

Modern hunting bows are usually recurved, but the straight limbed bow is still seen occasionally. Straight limbed bows are almost arc-shaped when strung but the recurved bow has tips which curve again, out of the basic arc-shape, and away from the archer. The recurved bow is easier to draw than a straight limbed bow of the same weight and has better cast, that is, it drives the arrow faster. The users of the straight limbed bow claim that it offers more accurate shooting.

Bows used to be made of different types of wood. Solid wood bows have almost disappeared from the archery scene. Bows are now made entirely of fiberglass or of a lamination consisting of several layers of wood and fiberglass.

Hunting bows come in different "weights." This term indicates the number of pounds of energy required to draw the bow fully. Bow weights run from 30 to 75 pounds, but the average hunting bow is somewhere between 40 and 60 pounds. Bows also differ in length.

Every potential hunter should have complete familiarity with the gun or bow with which he expects to hunt. He should be so at ease with this equipment that his manipulatory skill is not only perfect, but comes naturally. He can then devote his mind entirely to the situation at hand.

Ammunition

Firearms ammunition should be considered almost as a part of the gun itself. The sizes of guns are described in terms of calibers for rifles and handguns and gauges for shotguns. Gauge shows the number of lead balls and the diameter of the bore, which would weigh a pound. Calibers are expressed in one-hundredths of an inch. For instance, .22 caliber means 22/100. All cartridges of the same caliber do not fit a rifle or handgun designed for that caliber. Differences in the case or the amount of powder with which it is loaded may make a certain cartridge unsuitable, or even dangerous, for use in a firearm. In short, the cartridge must be the one specifically designed for use in a particular gun. When proper ammunition is used in a gun which is in top operating condition, the possibility of a "blown" gun is virtually eliminated.

There are many hunters who make their own ammunition, a process called reloading. A cartridge case in good condition may be used a number of times. Reloading requires a thorough knowledge of the type and amount of powder which goes into a certain load. It also requires scrupulous attention to detail on the part of the reloader. Carelessness can create the risk of wrecking the gun and injuring the shooter.

Types of ammunition for sporting arms are much alike. Each type consists of four basic parts: primer, case, powder, bullet (or shot). There are two basic types of cartridges, rimfire and centerfire. These terms designate the location of the primer and do not indicate any difference in the components which make up the cartridge. The cartridge used in the common .22 caliber rifle is rimfire. Larger caliber cartridges are centerfire. The case is the container for all of the components. The primer furnishes the ignition. The powder burns and the resulting gasses, which expand very rapidly, push the bullet or shot from the barrel of the gun. The operation is similar to that of the sparkplug, gasoline vapor, cylinder, and piston in an internal combustion engine.

Shotshells differ from rifle and pistol ammunition in that they include wads which separate the powder from the shot. When the shell fires, these wads push the shot charge through the barrel of the shotgun.

Gunpowder comes in various sizes and shapes. These characteristics, as well as chemical composition, control the speed at which the powder burns. The burning rate is important to safety. A given amount of a fast burning powder will create greater pressures than an equal amount of a slower burning powder. Casual experimentation with reloading can cause trouble. Priming compounds are stable but touchy. Cartridges should not be struck or exposed to great heat. However, they are completely safe when handled properly.

Arrows should be mated to the bow with which they will be shot. Matching the arrow with the bow is called spining. Arrows which perform well when shot from a 30-pound bow may perform poorly when used with a bow of a different weight.

Arrow shafts are made from several different materials, the most common of which are wood, aluminum, and fiberglass. Wooden arrows are still widely used but the other materials, although more expensive, are less subject to breakage and warping. Arrow length varies and is related to the length of the bow arm of the shooter. Generally, men shoot 28-inch arrows and women and young people use 26-inch.

The parts which make up an arrow are: shaft, head, nock, fletching. The nock is the slot at the rear end of the shaft into which the bowstring fits. Fletching consists of feathers (or equivalent) just ahead of the nock. The feathers are fastened to the shaft along spiral lines and cause a stabilizing spin in flight. One of the feathers serves as a cock feather and stands perpendicular to the bowstring when the arrow is nocked. It is usually a different color. The tip of the hunting arrow is called a broadhead. Broadheads are made in a variety of designs but fall into three general designations. The single-blade is a one-piece point with the two edges sharpened and comes in numerous shapes. The bodkin is three-bladed. The multi-bladed point has four or more cutting edges.

While firearms ammunition is entirely safe under normal handling conditions, broadheads are inherently dangerous because of the razor-sharp cutting edges. They should be handled carefully when they are examined, repaired, or drawn from the quiver (the carrying container for the arrows). The design of the quiver is quite important since it should protect the hunter from his own broadheads. The hunter must guard against injury when drawing a broadhead from the quiver in the field.

Safeties

Many types of firearms, especially those used in hunting, have some sort of a mechanical safety. Too often, the safety is a source of false confidence for hunters; as it is a mechanical device, it can fail. It should never be considered a substitute for safe gun handling practices. Safeties do, however, have their place in gun handling. When the gun is loaded and ready to fire, it should be kept on "safe," except when a shot is imminent. Proper use of the safety will help avoid accidental discharge of a gun.

Although the bow does not have a safety, accidental shooting can be avoided. An arrow should not be nocked with the bowstring pulled. Even that slight tension is sufficient to propel an arrow several yards if released accidentally.

Cleaning, inspection, storage

Learning about hunting implements should involve developing an appreciation for them as objects. Modern sporting arms are mechanical works of art; they have fine finishes and exhibit excellent craftsmanship. With regular maintenance and proper care, they should last a lifetime.

Close examination of guns, ammunition, and bows and arrows should be made before use. Guns should be checked, while unloaded, to insure proper functioning and that there is no obstruction in the barrel. Between seasons, they should be checked periodically to prevent rust. Check ammunition before going to the field to be sure that it is clean and free of high primers. Also, sometimes the primer is not fully seated, and high primers can cause jamming of the action or even accidental discharge of the firearm. They are fairly easy to detect by touch or sight. Reloaded ammunition should be inspected carefully for cracked or malformed cases.

Archery equipment should be inspected closely. Cracked bows or arrows are potential sources of injury. Frayed bowstrings may break and cause erratic or unintentional flight of the arrow. Sudden release may also break the bow. Arrows should be checked for sharpness, cracks, secure fletching, and damaged nocks.

After use, inspect hunting equipment for damage and clean thoroughly. Guns should be oiled lightly, inside and out. Excessive oil can collect dust and lint which, in turn, attract moisture. Excessive oil also seeps into the wooden parts and causes deterioration. Archery tackle should be inspected closely and cleaned. The bowstring should be waxed periodically with special wax for this purpose. The bow should be checked for dirt between the tips and the string.

Wide ranges of temperature and high humidity are the enemies of guns, ammunition, and archery equipment. Find a storage place where the temperature is even and the humidity is constant and moderate. To protect children, store guns in a locked gun case, closet, or similar place. Ammunition should be locked up separately.

Guns should be stored completely unloaded (breech and magazine). The action should be closed and the gun uncocked. Bows should be unstrung and hung up for storage. Broadheads should not be left in the quiver for long periods of time because accumulated moisture can cause them to rust and warp. They should be stored in the box in which they were packed originally, or one similar to it, since it offers support at both ends. Broadheads should be locked up out of the reach of children.

SHOOTING

Marksmanship training develops manipulatory skills and gives the hunter confidence in his ability to hit the target.

If the delivery of a shot to a precise point risks safety, the shot should not be fired. External stimuli, rather than lack of shooting skill, could cause a shot to go wider of its mark. Skills involved in accurate shooting are not learned quickly. Sources on "how to shoot" are listed at the end of this chapter.

Rifles and handguns

The elements which determine the course of a bullet from a rifle or handgun are the same, in spite of the fact that the two guns differ in size. The theory behind shooting is simple — the sights of the rifle or handgun are aligned and the gun is fired without disturbing that alignment. This condition is difficult to achieve in any setting but a laboratory. When the gun is picked up to shoot, the movement of the body, involvement of certain muscles, eyesight, trigger finger control, breath control, and other elements affect the point at which the bullet strikes the target. The key to the process is proper alignment of the sights.

Sights used on hunting guns are either *open* or *telescopic*. Open sight components include a front post sight which is located at, or near, the muzzle of the gun. The rear sight, a notch which may have any one of several shapes, is located near the breech end of the barrel. Hunters should *sight in* their guns. Sighting in involves firing a number of shots at a target at a known distance. The hunter, after suitable adjustments of the sights, gets *on target*. Alignment of the sights involves holding the gun so that the front sight appears to the eye to be precisely in the center of the rear sight. The top of the front sight should be in the same plane as the top of the rear sight. Most hunters sight in their guns in such a way that the shot hits the spot at which the top of the front sight appears on the target. Telescopic sights make sight alignment simpler for the hunter. The sighting in process gets the telescope into alignment with the gun. The hunter simply looks through the telescope and the shot is fired when the crosshairs or post are in the proper relationship to the target.

The trigger is *squeezed* when a rifle or handgun is fired. Sudden actuation of the trigger will cause movement of the gun and the shot will be wide of the mark.

Stability of the rifle while the trigger is being squeezed has much to do with an accurate shot. In target shooting there are rigid rules about how this stability may be obtained. Artificial support is illegal. The shooter must use body conformation and a rifle sling to achieve stability. The hunter, however, is not restricted by such rules. In fact, he should use any artificial support available to him. If there is no artificial support, the shooter should use his own body for support. When muscles alone are used, a tremor usually results. The arm supporting the gun should be directly under it. If the hunter is standing, the supporting arm can be propped against the body for additional support; if kneeling, the supporting arm should be propped on his knee. When the hunter can find a fencepost, a limb, or other support to lean against, the arm is still used to support the rifle — it is not rested directly on the support. Ordinarily, in handgun shooting, no support is allowed. Even the free arm is not used. In hunting, however, the chances of an accurate shot are considerably improved if support is used.

The hunter also must learn to control his breathing. Just before the shot, fill the lungs with air. Enough air should be exhaled to allow holding the breath comfortably for a few seconds. Active breathing must be halted while the trigger is being squeezed.

Through practice, physical requirements for delivering an accurate shot can be molded into a familiar, nearly automatic pattern. Practice also increases the manual skills needed for safety.

Shotguns

When shotguns are used as rifles, with rifled slugs on big game, they are fired in the same way as rifles. Shotguns used for this purpose often have sights similar to the open sights used on hunting rifles. The technique for shooting accurately is the same as that used with the rifle.

Most shotguns are used on moving targets, and the shooting technique is entirely different from that of rifles. Sights are not used. Some shotguns have a small bead at the muzzle end of the barrel which serves only as a means for locating the end of the barrel. The shotgun is pointed rather than aimed. The shotgun is mounted to the body in such a way that, during shooting, the body and gun move as though they were one piece. The eyes do not move independently, but instead become the guide for the entire upper portion of the body. The gun follows the body. This is what is meant by pointing.

The shooting stance for shotgunners is very similar to the stance used by boxers. Placement of the feet is important; the leading foot should point in the same direction that the shot is to be fired. The body is inclined forward slightly. The hand supporting the shotgun is forward. The supporting hand keeps the muzzle swinging with the eyes and body. In fact, many shotgunners place the hand under the gun in such a way that the forefinger actually points. The hand then moves as if it were pointing out the target.

The *lead and swing* technique is the most widely used leading device, especially for beginners. As the gun swings with the target, the speed of the movement is increased to overtake the target. Just as the muzzle passes the target, the trigger is pulled. In shotgun shooting the trigger is moved abruptly but in such a way that it does not pull the gun out of its arc. The gun continues to move in the same path after the shot is fired. The continued movement of the gun during and after firing causes the shot to string out in a horizontal pattern. The follow through and spreading of the shot compensate for the reaction time of the shooter, the functioning time of the gun, the time required for the shot to reach the target, and the movement of the target while all these other things are happening.

Shooting the bow

There are several steps involved in hitting a target with archery tackle. These steps are similar to those involved in shooting guns. They involve the same position, sighting, breath control, trigger squeeze, and follow through.

The archer stands at a right angle to the target with his feet spread comfortably. The body is not twisted. The toes are on an imaginary line which runs to the target.

When nocking the arrow, the bow is held parallel to the ground with the string toward the body. The bow supports the arrow while it is being nocked. The arrow is nocked with the cock feather pointing up; then the bow is raised. As the bow is raised, the string is brought back with the first three fingers of the shooting hand. This step is called drawing. The handle of the bow is gripped firmly but not squeezed. Control is necessary but a heavy grip could cause muscle tremor. The handle is brought up to a point just below eye level. The bow arm is straight but flexed slightly to give the string clearance. The point to which the string is drawn is called the anchor point, and is approximately at the upper, back portion of the cheekbone. All archers should develop a specific point as the anchor point to maintain consistency in shooting.

Bow sights, which are fairly common on hunting bows, have distances marked on them. Through *sighting in*, the hunter discovers what the location of the sight must be for the arrow to go a certain distance. Two other aiming processes are used in archery. The *point of aim* method relates the tip of the arrow to an object in the foreground. When the tip of the arrow, the archer's eye, and an object at a certain distance are in line, the arrow will fly a known distance. The third method is *instinctive shooting*, whereby the archer uses his eye much as a shotgunner does. The bow and arrow follow it. He is also aware of the location of the tip of the arrow. The height adjustment of the bow is done almost reflexively. The shooter shoots with both eyes open, just as the shotgunner does; accurate depth perception is essential to the instinctive shooter and sight from both eyes is required.

The foregoing has taken place almost as one motion. This motion completed, the archer *holds* for a few seconds before releasing. Aim is checked and the pause is taken to ensure that everything is as it should be. This is a deliberate part of the shooting procedure and is called *holding*.

The release of the bowstring and arrow is as delicate as a trigger squeeze. The hands open smoothly and quickly and the fingers move away from the string and the arrow nock at the same time. Sudden motion or pulling to the side will spoil the shot.

Naturally, the speed of an arrow seems slow when compared to a bullet. Regardless of speed, a follow-through is necessary for both types of equipment. Concerning archery, the position should be held until the arrow reaches the target. The archer can then be certain that he did nothing to change the flight of the arrow after its release.

FIELD SAFETY PRACTICES

There are many rules for gun and archery safety practices. The real problem lies not in learning the rules but in knowing when to apply them. The safest hunters master certain simple manipulatory skills related to loading, unloading, and handling. When these actions become almost automatic, the hunter can devote more of his time to the recognition of potentially hazardous situations and the judgments required to overcome them.

There is an old phrase which merits attention. Many people have said, "It's always the unloaded gun which does the harm." This statement may mislead one into thinking that there really is no way to make a gun safe. The saying should suggest instead that people often assume a gun to be unloaded and discover only after an accident happens that it was indeed loaded.

Safety rules for guns

1. *Treat every gun as if it were loaded.* There is never any excuse for failing to know whether a gun is loaded or not. Guns should be unloaded when the shooting or hunting is finished, and then checked again before put away. Leaning on the muzzle of an empty gun, or placing the muzzle on a foot and leaning on the butt, is a dangerous practice. Soon the habit becomes established and the gun is used as a prop when it is loaded. Leaning a loaded or unloaded gun against a tree or other insecure support is unwise.

2. *Always point the muzzle in a safe direction.* Even the empty gun should not be pointed toward another person. The safe hunter always knows where his gun is pointing, even when he cannot see the muzzle. The gun must become so much a part of him that it becomes almost a physical extension of himself.

Much bad gun handling takes place when several hunters begin loading their guns in preparation for the hunt. Often they stand in a group, talking while loading their guns. Nearly everyone has one or more guns pointed at him.

Out of respect for safety, each hunter should face away from the circle while loading his gun. He must then carry it so that it does not point at anyone.

3. *Be sure of your target — and what is beyond.* The shooter should know exactly what he is shooting at. If hunting, he should see the whole animal and clearly enough to identify it positively. The gun should be used as if it were a camera. Like the nature photographer, the hunter should have a clear, unmistakable picture of the whole animal before he shoots. He should also anticipate where the shot will go if it fails to hit the game or passes completely through it.

Gun carries

There are a number of ways to carry a gun in the field which are safe, yet keep the gun available for use. Standard safety practices include the following: the safety should be on; the finger should be kept outside the trigger guard except when the hunter is ready to shoot; the muzzle should point in a safe direction and be under control. These practices apply whether the hunter is by himself or with a group. Many hunters carry the gun with the barrel over the shoulder and the hand gripping the small of the stock. This is a good carry except when someone else is behind. Carrying the gun cradled in the bend of the elbow with the same hand, or both hands holding it, is also a safe carry — but not when there is another hunter on that side. Many hunters use a carry which causes the gun to point forward and down. The butt is under the arm and the forend of the gun is supported by the forearm. This, too, is a good carry — but not when the hunter is behind someone else. The hunter must be as aware of the constantly changing movement of other people and their relationship to the muzzle of his gun, as he is aware of the shifting of automobiles in traffic and the need to change course.

Zones of fire

When parties hunt together the areas to be covered should be decided in advance. If the group is hunting birds, for instance, and walking fairly closely together across a field, definite assignments as to the zone each party will cover are imperative. It is obvious that all hunters cannot shoot at every bird they see without endangering each other. In a group of three, the center hunter takes the birds going straight away from him. The hunters at the sides take those on their respective side of the line. When parties split up and individuals hunt separately over a wide area, each hunter should be assigned a section and keep to it.

Self-protection

Some hunters do things which endanger their safety. For example, it is considered bad practice to carry deer skins or antlers in such a way that they could be mistaken for a live deer. The safe hunter must avoid actions or appearances which might be misinterpreted by another hunter.

There has been considerable discussion concerning colors of clothing which would make the hunter so distinguishable that mistakes in identification could be avoided. Only a few states require that a certain color be worn; of these, some require red and others yellow or florescent orange. Tests have proved that dark reds virtually disappear in poor light conditions. Generally, a bright color, one which would make the hunter stand out from his environment, is recommended. Today, *blaze orange* has more backers than any other color.

Self-protection involves, among other things, getting over, through, and around obstacles. Good practice dictates that the gun should be unloaded when there is no possibility of an accurate shot. In practice, since an accurate shot cannot be made while the hunter goes over, under, or through a fence, he should unload. The gun should be placed flat on the ground on the other side of the fence and the hunter should cross at the butt end of the gun. When two hunters want to cross a fence, they unload. One hunter holds both guns while the other hunter crosses the fence. The guns are handed across and the second hunter crosses. This rule also applies when crossing logs; going through heavy brush; climbing trees, steep banks, and cliffs; or crossing any point where footing is bad.

Safety rules for archery

While hunting accidents with bows and arrows are comparatively few, the bow hunter must realize that the potential for accidents exists every time the bow is drawn.

1. *Never draw a bow or nock an arrow if someone is in front of you.* Accidental release of the broadhead is always a threat. Another person should never be used as a target, nor should a target ever be held by a person. Great care should be taken when examining, showing, or handling broadheads in a group. The only safe place for a broadhead, except when it is about to be shot, is in its storage box or quiver.

2. *Never release an arrow without being able to see its full path to the target.* This practice is especially important for bow hunters. Bow hunters often use camouflaged clothing for hunting and are sometimes difficult to see. The target should be seen clearly. Also, an arrow should never be shot straight up in the air.

3. *Never use imperfect equipment.* All equipment should be inspected carefully before use. Loose or broken nocks, cracked bow or arrow shafts, loose fletching or broadheads, or a frayed bowstring may cause injury to the shooter or to another hunter.

The same field safety practices mentioned in the section on guns generally apply to bow hunting. There are, however, a few differences. The arrow may be kept in the shooting position in the field but great care must be taken not to point it at anyone. The nocked arrow may be held tight against the string with the index finger of the bow hand, but there should be no tension on the bowstring. The bow may be drawn quickly but the chance of accidental release is to be avoided. The broadhead should be in the quiver when the hunter cannot make an accurate shot or when he stops to rest or crosses a fence.

Automobiles are not the place for loaded firearms, strung bows, or unprotected broadheads. The firearm should be unloaded, the bow unstrung, and the broadhead in its quiver or storage box. Ready-to-shoot hunting equipment should not be taken into camp or placed in automobiles unless the automobiles are used in open country to find game. Where this is true, the hunter should open the action of the gun. An accurate shot cannot be made until the automobile is at a standstill. Where the hunter is doing the driving, the gun should be carried in the same opened-action condition, but it should be in a rack which will hold it securely.

Recently, in a certain Rocky Mountain state there were more deaths from heart attacks among hunters in the field than there were from gunshot accidents. Many hunters are once-a-year outdoorsmen. Hunting, in many cases, is a vigorous sport. A physical checkup is needed, especially if the hunt will involve heavy physical exertion or take place at a high altitude. Physical conditioning is also important. Fatigue distorts judgment and opens the door to accidents.

If possible, the hunter should be familiar with the hunting area in advance. Knowing the territory guards against becoming lost and helps the hunter to condition his outdoor vision and to know where any natural hazards exist. Many hunters fail to get game or make mistakes in identification because they are unaccustomed to seeing things under this new light.

References

American Association for Health, Physical Education, and Recreation. *Shooting and Hunting.* Washington, D.C.: The Association, 1960. 94 pp.

Haugen, A. O. and Metcalf, H. G. *Field Archery and Bowhunting.* New York: Ronald Press Co., 1963. 213 pp.

National Rifle Association. *NRA Home Firearm Safety.* Washington, D.C.: The Association, 1962. 20 pp.

———. *NRA Hunter Safety Handbook.* Washington, D.C.: The Association, 1959. 22 pp.

Shigley, F. D. *All About Guns For Boys.* Minneapolis, Minn.: T. S. Denison and Co., Inc., 1962. 48 pp.

Camping | ERNEST F. SCHMIDT, A.B.

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If anyone had taken a survey of the number of campers in the United States in 1492, he would have found that the figure was about three million persons — 100% of the population. In that day, the ability to camp and the ability to survive were synonymous, with flint arrowhead poisoning an occupational hazard. Camping was taken for granted, with its attendant hazards, as a way of life.

Beginning about 1850, when the population was 23 million (85% rural), a few people began to realize that camping had values and that some of the skills possessed by the Indians were too valuable to be lost.

In 1850, Daniel Carter Beard was born. Lord Baden Powell, who started Boy Scouting, was born in 1857. Ernest Thompson Seton was born in 1860. George Sears ("Nessmuk"), the pioneer outdoor writer, was born in 1821 and Horace Kephart in 1862. Each of these people was articulate and even eloquent about the advantages of camping and bequeathed priceless inspiration and guidance for today's campers.

By 1900, with the population at 76 million, of which 39% was urban, magazine articles on camping began to appear. During the next few years, youth agencies with programs emphasizing camping as well as safety oriented organizations, such as the American Red Cross, came into existence. In 1950, 64% of the population of 151 million lived in urban areas; now, the urban figure is more than 70%.

The number of "lone" campers has probably changed very little since Columbus' day. Today there are at least three million Americans and Canadians who take their packsacks or canoes to the forests, high mountains, or wild lake country in search of adventure and solitude. Another 40 million Americans also go camping, but in an entirely different manner, preferring to camp in trailer parks or national or state parks, and often just as close to the next camper as possible. To make space for camping vehicles and tents, the national, state, and local parks have provided thousands of camping places, and an ever growing number of private campgrounds have sprung up.

CAMPING — UNORGANIZED AND ORGANIZED

Unorganized camping applies to the lone hiker of the Appalachian or Pacific Crest Trail and his less venturesome counterparts in the trailer campgrounds. *Organized camping* is done by an organized group on either a fixed or moving base.

People camp for many reasons. Parents enjoy having the family doing something together and in an economical way. Fun and adventure are prime goals for both young and old. For young people, organized camps provide the special educational advantage of learning to live with others as well as having one's self-confidence built by achievement at one's own level. Both organized and unorganized camping offer educational opportunity, challenge for proving oneself in the outdoors, and a happy, healthy way of life.

But is it?

A STUDY OF INJURIES IN ORGANIZED CAMPS

Statistics on camping related accidents are extremely hard to obtain, but some studies have been made which provide information for preventing accidents in camping. In 1965, the Mutual Security Life Insurance Company of Fort Wayne, Indiana made a study of three and one-half million campers (mostly youths in organized camps) between 1962 and 1964, of whom 35,000 (that is, 1%) received injuries and illnesses serious enough to submit an insurance claim. Since 1965, the company has taken other samplings, which have validated the original statistics cited in the next column.

Several things must be kept in mind as we analyze the insurance claim record. First, because a claim involves money, the average cut or scrape in a camp represents an injury but not a claim. The health staff of a youth camp probably gives a bandage or sympathetic shoulder to 20 or more banged or bumped children for every one child who is seriously injured. Second, how many of these children, if they had stayed at home during the camp season and gone about their normal activities in their home and neighborhood, would have received injuries that would have also involved a claim?

TOP TEN REASONS FOR CLAIMS

Reason	Number of Claims	Percentage
Colds (including tonsillitis)	6,528	19.1
Cuts, lacerations	3,584	10.4
Sprains	3,270	9.5
Bruises	2,590	7.5
Skin inflammation (including poison ivy)	2,075	6.0
Upset stomach, stomach flu	1,941	5.6
Ear inflammation and infection	1,862	5.3
Infections (other than skin)	1,672	4.7
Broken bones	1,227	3.6
Puncture wounds	1,041	3.0
Total	25,790	74.7

The life insurance company also studied 88 death claims submitted by camps between 1958 and 1965. Of 16.2 million persons insured, the claims represented 5.4 deaths.

ANALYSIS OF 88 DEATH CLAIMS

Reason	Number of Claims	Percentage
Drowning	47	53.4
Automobile (including travel to and from camps)	22	25.0
Falls	5	5.7
Struck by car in camp	4	4.5
Freak accidents	3	3.4
Plane crash	2	2.3
Lightning	1	1.0
Horseback accident	1	1.0
Water skiing	1	1.0
Hit by falling tree	1	1.0
Hayride upset	1	1.0

A DOZEN DANGERS OF THE WOODS

As one lives in the outdoors, and even more importantly studies accident opportunities and prevention, one realizes that there are about a dozen dangers of the woods. Listed from kinds of dangers that *come to you* to those *you have to go to*, they are:

1. Poisonous insects
2. People
3. Fire
4. Sanitation
5. Water
6. Animals
7. Poisonous reptiles
8. Trees
9. Poisonous plants
10. Injury and illness
11. Exposure
12. Lost

Since Daniel Boone's day, the intensity of many of these dangers has decreased, but in areas like sanitation or injury, it has risen, as attested, for example, by the number of hunting deaths during an active season.

Danger no. 1 — poisonous insects

Insects can make miserable even the finest camping environment. Their lethal capabilities vary by locality but in the catalog of pests the following rank high in the United States:

1. Flies	6. Spiders
2. Mosquitoes	7. Chiggers (red bugs)
3. Wasps and bees	8. Black flies
4. Ticks	9. Punkies (no-see-ums)
5. Scorpions	10. Centipedes

House flies. House flies, because of their disease carrying ability, are probably the most menacing insect. Screening, poisons, and traps do block their filth-to-food routes, but denial of breeding places is the most effective solution. Latrines and kitchens must particularly be protected. Nonpersistent poisons may be used but their effects on beneficial insects must be considered.

In one camp which had a serious fly problem, someone used a new kind of fly trap which attracted the insects by scent, caused them to enter a quart jar, and killed them quickly. In the following week or two, the camp's fly population was noticeably reduced. Then the flies reappeared in numbers even larger than the original plague. A close examination of the fly traps revealed that the traps were also attracting "burying beetles," which are the undertakers for small animals and birds that die of natural causes. With the elimination of these beetles the dead animals of the forest remained on the surface and became the breeding area for more flies than were previously present.

Some camps have found that keeping a flock of chickens near the stable compost pile cuts the fly population drastically.

Mosquitoes. In some places the mosquito is merely a nuisance but in other places the disease it can carry is a menace. Repellents are effective on a short-term basis, but denying the mosquitoes a breeding place is the best solution. Because drainage may be impractical, nonpersistent or degradable chemical poison sprays are the recommended preventive. The poisons must be used with great care since they are indiscriminate and probably kill the good insects along with the bad.

Wasps and bees. One has to see the effects of a bee sting or wasp puncture to an allergic person to gain respect for these insects. They are not just a painful nuisance, but are a menace to life. Repellents are somewhat useful here but even more important is education in methods of avoiding these pests and in using great caution when they are nearby. Get competent medical advice and equipment *before* someone gets stung.

Ticks. Ticks, which live in bushy areas throughout most of the United States, can carry Rocky Mountain spotted fever. They can be carried in a house by a cat or dog. Repellents are helpful, but more important is avoiding places inhabited by ticks and carefully checking for ticks. A tick may crawl on a person for many hours before it actually "digs in." When it does, the tick has to be removed carefully to avoid crushing it and getting juices on your skin. Tweezers or the heat from a lighted cigarette or match are recommended for the removal.

Scorpions, spiders, and centipedes. Scorpions, spiders, and centipedes cause more psychological fear than physical harm. It is wise to check shoes each morning; to be cautious in rocky and brushy places and in rural dwellings; to be able to recognize black widow and brown recluse spiders. Black widows like the undersides of country sanitary facilities so a brushing away of cobwebs under seats is recommended.

Chiggers (red bugs). Chiggers are minute, spider-like creatures that live in the woods over a large part of the middle and southern areas of the United States. They crawl beneath people's clothing until they find a tight, sweaty place and promptly dig in, leaving a welt that itches and sometimes festers for one or two weeks.

A clear plastic coating (like nail polish) on a bite relieves a great deal of itching but avoidance of the chiggers in the first place is better yet. Don't sit on logs, keep clear of brush and leaves, and use plenty of repellent, including sulphur powder.

Black flies and punkies ("no-see-ums"). Black flies and punkies are occupational dangers of many hikers in forest areas. Insect repellent is the best solution. Punkies are particularly bothersome because of their small size, which enables them to walk through screenwire. Getting rid of low underbrush or tall grass near the camp denies shelter to black flies and mosquitoes.

Of all these pests, flies and mosquitoes cause campers the most misery. Education, proper poison or repellent that is applied correctly, and caution will solve most of the problems with insects.

Danger No. 2 — people

Whether through curiosity, malice, or carelessness, people can be a serious danger to campers. This is particularly true of girls' camps where privacy is important. Use No Trespassing signs and adequate fencing; arrange for police protection, good lighting, careful supervision of outposts in far-out camp sites, and in some cases, a night guard.

During hunting season, hunters are often a very serious menace as they disregard No Trespassing signs and hunt where children are hiking or camping. In this case, obviously the only adequate protection is active patrolling of the campsite by authorized personnel.

Vandalism, while not necessarily a source of injury, is another danger that all camps must face, whether the camp is remote from civilization or close to a city, or even just a campground. Here again, ease of access has a bearing on the degree of the danger and certainly too, active patrolling is, in many cases, the indispensable ingredient for protection.

Automobiles. Automobiles are lethal beyond all proportion to their numbers. Almost one out of 20 of the deaths reflected on the analysis of death claims was "struck by a car in camp." There are four logical answers to this danger.

1. To dispense with roads in the campground so far as is possible.
2. To restrict all vehicles to a parking lot and to allow no vehicles in the camp itself.
3. To train drivers of camp vehicles to handle their vehicle in a safe manner.
4. To forbid anyone from riding on the back of an open truck or any other vehicle that is not designed for carrying passengers.

Implicit in a camp's program are a great many safety hazards. Archery, rifle marksmanship, swimming, boating, sailing, hiking, climbing, horseback riding—these are all dangerous parts of the camp program *if* they are improperly taught or poorly supervised.

Danger No. 3 — fire

Sharp, pungent, and fresh in the noses and minds of all campers are the scent and smell of forest or camp fires in which they have been personally involved. Equally fresh, though a little harder to admit, is the lurking realization that proper precaution or better training would have prevented the fire, or at least alleviated to some extent its effects.

Basically, camping fires cause trouble in two areas: forest or fields and camp buildings.

Forest fires. According to our Forest Service, most fires are started by smoking. Lightning and a few other causes follow. Prohibition of smoking or use of good manners by smokers would probably eliminate almost half of all forest fires.

Camp fires escaping from control are another cause of fires and here the remedy is easy. First, don't build fires when the wind is too high. Second, always clear the area in which you are going to build a fire so that nothing flammable is close by.

In a few areas, such as the open plains, one may have to dig a hole to escape the wind. But in forested areas, it is usually smart to build a fire on top of something fireproof, such as rocks or loose dirt, so that no root ends are exposed to pick up a spark and transmit it for many feet or yards before the forest catches fire.

Fire permits are required in many states and in almost all states there are local, state, and federal experts who could teach proper methods of fire control and the best ways to organize one's personnel into an efficient, effective fire fighting crew.

Equipment of the more sophisticated types is expensive. An oil drum filled with water in the middle of a camp site or a couple of #10 tin cans hanging from a stick near each tent are inexpensive and effective. But, the best fire fighting tool of all is a trained group of camp leaders with a plan, practice, and plenty of training.

Fire in camp buildings. The main cause of fire in camp buildings is carelessness with potential firemaking materials, with maintenance of heaters or fireplaces, in the inspection of electrical wiring and fixtures, and in the general building area. Matches cannot be left loose for mice or chipmunks to gnaw; oily rags cannot be thrown into a corner to ignite by spontaneous combustion; flammable rubbish must be disposed of promptly; fire extinguishers or water and hose must be available and operative; flammable liquids of any kind must never be stored inside buildings.

Gasoline or kerosene must be stored in a locked, ventilated shelter, well away from buildings. The use of lanterns using liquid fuel is extremely dangerous, particularly if the lanterns are old or in poor repair. Wherever this type of illumination *must* be used, it should be carefully supervised and handled by a capable adult.

The presence of a pool or small pond close to buildings will almost automatically reduce fire insurance premiums. Cultivation of the local fire department — even if it is several miles away — could be even more profitable than a good insurance policy. Get their understanding and cooperation.

Camps in heavily forested, high-fire danger areas should have an adequate fire-break around the property and most certainly should have training and equipment sufficient to evacuate the property at high speed when danger threatens.

DANGER NO. 4 — SANITATION

Water. While many states have laws regarding the purity of the water supply for an organized camp, others still lack such protection. Lone campers, the camp director, or camp health officer must see that drinking water is pure. This is realized generally by adults, but there are always children who must be carefully taught that the clean-looking, running stream may be deceptive.

Water can be purified by boiling or by treating with chemicals, such as iodine or chlorine (halazone). State agencies will test water samples for purity, but they will caution that the test applies *now*. Any clear, pure well or spring can be contaminated within five minutes by a rainstorm or animals. The safest way is to assume that the water is contaminated and purify it. Water storage tanks and vessels must not only be clean to start with, but screened against rodents, insects, and drainage. A new water system in a camp or a travel trailer should be flushed out thoroughly with chlorine treated water before use.

The source of the drinking water in any camp, whether it be a deep or shallow well, spring, or stream, should be carefully safeguarded from contamination. One very fine midwestern camp was closed by the state when it was discovered that the effluent of the septic system flowed into the lake within a few yards of the intake of the camp water system and not too far from the swimming area.

Per capita water supply needed each day is: 30 gallons (no flush toilets); 50 gallons (with flush toilets, showers, drinking fountains); and 80 gallons (with flush toilets and a swimming pool). Minimum storage capacity should be for a 48 hour supply of water.

Food. Obviously food handlers must pass required state exams. The camp director is responsibile for getting his food handlers carefully examined by a licensed physician.

Food storage areas must be rodent and insect proof, with refrigeration facilities at a temperature not to exceed 40°F. for walk-in refrigerators. A thermometer should be kept in the refrigerator to check this.

The service area for food must always be immaculate and subject to frequent inspection. There must be screens in the windows and handwashing facilities in the kitchen with plenty of hot water, soap, and towels for kitchen personnel.

Kitchen equipment and dishes must be kept clean and stored properly in dust, rodent, and insect proof areas. Dishwashing is another essential to sanitation. There are five clear steps in dishwashing, whether one is family camping or in an organized camp, or even in one's own home.

Step 1. Scrape the dishes to remove garbage.
Step 2. Pre-rinse to clear away small particles of food.
Step 3. Wash in hot (120° in a tank or 160° in machine) water, treated with detergent or soap.
Step 4. Rinse in water at least 180°F. in temperature, or in sterilization chemicals.
Step 5. Dry — *without* a towel. Dishes, after rinsing, should be air dryed as quickly as possible. This is particularly true of mouth-contact dishes such as cups and silverware, which, incidentally, should always be washed first.

One problem does remain — dishwater disposal. If enough of it is thrown in one spot, it will draw flies and cause odor because of the small particles of food remaining. In a resident camp, this water can be sent into the water disposal system, but on an outpost camp, one will need a sizeable tin can with quite a few small holes in the very bottom, a handful of straw, hay, grass, or pine needles, and a dry spot (different each time) somewhere away from camp. Pour the dishwater through the grass, etc., let it soak into the ground, and then burn the grass. A plastic bag, filled with grass, leaves, or needles, etc. and with pin holes punched in the bottom will do just as well and the whole thing can be burned. In any case, the water should be distributed where it will quickly soak away.

Garbage disposal. A camp in the wilderness with a small group or only a few individuals might seem a simple thing, but those who have found these campsites have seen what people who lived there have done. Two suggested rules are: (1) burn everything burnable and (2) carry everything else back to civilization. If this second rule seems a bit drastic or hard to do, make the burning and crushing of tin cans and other nonburnable containers an honor job and a challenge. If the pile seems imposingly big, plan your containers better next time.

Garbage disposal is a problem whenever there is a large quantity of garbage. Where the topography and acreage allow, land fill can be used. It is wisest, however, to use available municipal or individual garbage disposal facilities and have the stuff carted or trucked away.

Algae and aquatic weeds. If lake water is warm or shallow or fertilized from an agricultural upstream source, inevitably there will be algae and aquatic weeds, which may range from merely unpleasant to "dangerous." Chemicals can effectively and safely control this nuisance. But in order to save the animal life in the lake, expert guidance should be sought before treating the water.

Danger No. 5 — Water

Under the section dealing with "Aquatic Activities," swimming, diving, boating, canoeing, sailing, skin and scuba diving, outboard motoring, water skiing, and other sports are covered. They are all well-known and important camping activities whose popularity — and hazardous nature — must be recognized.

Too much water at the wrong time or place can be serious. Campsites should be located where abnormally high floodwater cannot reach the site — or, in another season, where snowslides could not engulf it. A tent or building never should be placed in a normal drainage route.

Danger No. 6 — Animals

One of the major attractions of the outdoors is animals. Many organized camps have riding horses. These give a lot of pleasure, but there are also hazards. The two major sources of injury with riding horses are: (1) fall-offs and (2) kicks and bites received from the horse.

Proper direction, training, and supervision lessen the chances of these injuries occurring. Stables and riding rings should be located to avoid the health hazards of flies breeding in manure, drainage emptying into water sources or swimming areas, and uncontrolled dust in the riding ring.

Pet dogs in camp can be another hazard, no matter how friendly, docile, or gentle they may be. Children *do* tease animals. It is doubtful that camp directors will want to take a chance of a dog bite.

Mice and rats may be a problem around camps, principally at the sanitary areas. Chipmunks, squirrels, bats, and rabbits are often found. The bites, kicks, or scratches of these animals can be not only painful, but dangerous because of the possibility of infection.

Other animals found in the fields and forests around camps are bears, deer, porcupines, skunks, raccoons, and foxes. Of these, the bear is by far the most dangerous, especially the tame looking bears found in national parks and forest. Although there are lots of fearless bears, there is no such thing as a tame bear!

Since a grown black bear can take a child's hand off with one bite, campers should *never* under any circumstances feed or get near a bear, no matter how harmless it may look.

Male deer in the autumn rutting season are dangerous. Except for human curiosity or carelessness, procupines are not really dangerous. Quills are barbed and extremely sharp. Skunks, raccoons, and foxes are subject to rabies. Upon seeing one of these animals behave in a strange or fearless way, stay away, especially from foxes, who are normally shy.

Skunks require nothing but respect and distance. Raccoons are intelligent and quickly learn that man can be a good provider. But man should remember that raccoons are fighters and capable of whipping a dog their own size or larger.

Danger No. 7 — Poisonous Reptiles

While reptiles cannot be disregarded as a source of injury in the outdoors, they are vastly overrated. Snake bite deaths average 14 persons a year, while bee and spider bites account for 30 deaths a year.

In northeastern United States (north of the Ohio River, east of the Mississippi), there are only four kinds of poisonous snakes. They are the pigmy rattlesnake, the timber rattlesnake, copperhead, and (rarely), water moccasin. The water moccasin is occasionally found as far north as southern Illinois and parts of Virginia.

In the southeastern part of the United States (east of the Mississippi, south of the Ohio River), there are seven kinds of poisonous snakes: the phymy, timer, canebrake and diamondback rattlesnakes, copperhead, water moccasin, and coral snake. Six of the these snakes are pit vipers with a distinct depression between the nostril and the eye and somewhat below this line. The coral snake, found only in the extreme southern part of the United States, is small and brightly colored, with black snout and red and yellow bands touching.

West of the Mississippi River, there are 26 kinds of poisonous snakes. Of these, all but five are rattlesnakes. There are two kinds of copperheads, the water moccasin, and two kinds of coral snake in the extreme southern part.

In the far Southwest, there is one poisonous lizard, called the Gila monster. Its saliva is poisonous, but it is not considered very dangerous because of its slowness and remoteness.

In a camping area, some effort should be made to control the poisonous reptile population. But, since these snakes also do a lot of good, it would probably be a mistake to try to eliminate them completely. Campers should be trained to recognize the snakes and avoid environments which might harbor them.

The bites, as any puncture wound, should be cleared of as much poison as possible by suction. The victim should not exercise violently or become frightened so that his circulation increases greatly. Obviously, a doctor's care and hospital treatment should be obtained as quickly as possible. Again, snakes are more dramatic; wasps and hornets are more deadly!

DANGER NO. 8 — TREES

A tree may not seem particularly lethal, yet of the 88 death claims, several deaths were caused by trees. One was caused by lightning under a tree; another by a falling tree; and several others by falls, some of which may have been from trees.

During a thunderstorm, avoid taking shelter under a tree, exposing yourself on an open mountaintop, or being in a metal canoe on an open lake. Few people have survived to tell what it feels like to be too close to a bolt of lightning. There is danger of being hit by falling limbs or whole trees during a windstorm.

Trees with large, dead branches, trees that are diseased, rotten at the base, or dead, and a tree or a group of trees undermined by erosion in or near camp should be removed.

DANGER NO. 9 — POISONOUS PLANTS

Commonest of the plants with poisonous juices are poison ivy and poison oak. They have compound leaves, three leaflets to the stem. The plant may grow as a series of leaflets coming out of the ground, as a low shrub sometimes reaching up as far as 25 or 30 inches, or as a climbing vine which could be the size of a man's thigh in diameter and treetop high. The seeds of poison ivy and poison oak are sometimes spread by birds. This means that poison ivy is very likely to grow below a tree in which birds commonly perch. Poison ivy prefers the edge of forests, or under lone trees because it likes semi-shade and cannot tolerate brilliant sunlight or deep shade.

Best preventions are education and elimination of the plant by poisons or by persistent and thorough use of a hoe or similar cutting, digging tools. One must remember, however, that the sap of the roots is as poisonous as the sap of the leaves or stems.

This sap or "varnish" has highly irritant qualities on the skin of most people. Unless this is removed by soap and water within 5 or 10 minutes after exposure, it will, within a few days, produce an intense itching with reddening and blistering of the skin and soon after this, open running blisters that itch terribly and are susceptible to secondary infections of several kinds.

A camper need *not* have direct contact with the plant to get poison ivy. He can get it from a dog or cat or by touching shoes or clothing or camping gear that have been in contact with the plant, or by breathing smoke of burning poison ivy or poison oak leaves.

Poison sumac is fortunately a much rarer (and larger) plant and is usually found in swamps, but its effects are equally drastic.

There are, of course, many plants that are extremely poisonous when taken internally. Some mushrooms and quite a few berries are in this category. The important thing is to have these plants clearly identified by knowledgeable persons and then avoid them. Unidentified berries should not be eaten.

DANGER NO. 10 — INJURIES AND ILLNESSES

Into this area fits every one of the top 10 reasons for insurance claims and most of the miseries of today's camping. Common types of injuries and illnesses include:

Colds. Preventions are proper clothing, food, and rest. In the organized camp, rest should be built into the program.

Falls. With 5.7% of the deaths in the analysis of death claims given earlier in this section caused by falls, this is obviously a serious cause of injury. Some falls are probably inevitable, but falls from rocky places or cliffs can be controlled by proper fencing and training. The chance of falls from trees can be reduced by sawing off the lower limbs and removing rotten trees and branches. Falls in and around buildings can be lessened by proper maintenance and supervision, and falls on the trails of an organized camp can be diminished dramatically by enforcing a rule that prohibits running on the trails.

Probably the most effective preventive of accidents is an experienced camp director or counselor, who knows children well enough to anticipate what they are going to do and thus can foresee potential accidents.

As one eliminates, or at least reduces, the incidence of falls, one also reduces the number of cuts, lacerations, abrasions, sprains, bruises, broken bones, puncture wounds, and infections.

An effective preventive of injuries and illnesses is a health system that includes:

1. A thorough health examination should be given by a physician before the child goes to camp. Although the best time to receive the examination is one month prior to entering camp, the child may receive it as much as one year before the camp season.

2. When the child reaches camp, he should receive a recheck by the camp's health staff.

3. The third defense is the health staff of the camp. Perhaps a doctor, and certainly a nurse, should be on the staff. If the camp lacks a resident doctor, a nearby doctor should be available on a contractual or agreement basis.

4. The fourth defense lies in the programs, which should be tailored to prevent the children from becoming too tired, and the supervision of the camp oriented to constant vigilance.

It is necessary to have an arrangement with the nearest hospital and to maintain a camp infirmary for treating wounds and providing semi-isolation for more serious illnesses. The infirmary should operate in a safe and sanitary manner. Transportation must always be immediately available so that if a child requires hospitalization, no time will be lost.

For the family camper, the availability of health facilities sometimes poses a problem, but the same kit of first aid supplies that the camp would have should be with the family camper, only on a smaller scale.

Just as important as an adequate first aid kit, however, is a trained health staff, supervised closely by an alert camp director, who has carefully worked out a standard operating procedure for emergencies. Telephone numbers should be prominently posted.

For camps away from civilization, a two-way radio-phone is useful. Some traveling camps have two-way communication between their busses or station wagons. Where a family is using a camper on its pickup truck, there should be wire communication between the cab of the truck and the body of the camper.

For the resident camp, prevention can be built-in: guard rails on the steps, immediate replacement of broken boards in floors or platforms, guy wires marked by white ribbons, visible white ropes holding up tents, fences at key locations, and level pathways.

During the planning stage of camp construction a consultant or camp director can be worth his weight in insurance. Hazards should be eliminated before they are built-in. Adequate insurance can avoid financial catastrophe.

The camp director should not accept a child into camp unless he knows whom to contact if something goes wrong. This also applies to a cross-country camp, and even to family campers.

In most agency organized camps, a regular report system informs the camp's national headquarters immediately if something goes seriously wrong in the camp. The camp's health staff should maintain a record of all camp injuries, even minor injuries, which might become major. The law requires that records of treatments be kept until two years after the child concerned has reached his "majority." (A Pennsylvania case established that a "child" can sue on his own after age 21, even though his parents may have settled a claim.)

Danger No. 11 — Exposure

Heat and cold are the major causes of injury from exposure. Sunburn is the most common type of heat exposure and can be extremely serious. Prevention, by staying out of the sun, is almost impossible with children, but adequate clothing and skin preparations will reduce or slow down the burning. When children are in the sun for many hours or days, they must not only be provided with proper clothing and sunburn lotion, but also with dark glasses to avoid sunstroke. Heat exhaustion, which occurs in extremely hot weather, can be prevented by proper rest and control of activities.

Sunburn is not limited to hot weather. On a snowfield the burning might affect the eyes, which would produce snowblindness. Formerly sunburn from snow and snow blindness and even frostbite were unheard of in a camp. But with increasing numbers of people using the outdoors in cold weather and with 100,000 snowmobiles in use (in 1968), inevitably there will be an increase in deaths by exposure. If the riders of these vehicles fail to provide adequate survival gear and equipment to take care of themselves away from civilization in bitterly cold climate, they will be subject to serious hazards if their vehicles break down. Camping under extreme heat or cold requires far more staff orientation and training than camping under normal circumstances.

Danger No. 12 — Lost

Leaders of parties heading into the wilderness must not only have a schedule of departure and return, but must notify the authorities who are in charge of the particular area to which they are going.

Parents on family camping trips and camp directors in organized camps must assume that every child has the potential of becoming lost and should have training in what to do if lost. Training should include not only the use of equipment, but the vital ability to force oneself to sit down, eat a candy bar, build a fire, do anything to prevent panic.

In addition, one should use every means to establish one's location — sounds, the slope of the ground, the direction of the wind, etc. Boys and girls should be taught the various methods of walking in a straight line in forests. The danger of traveling alone, separating from a companion, or the extreme danger of traveling at night must be emphasized. If no fire can be built, a bed of leaves or other kinds of shelter should be used and the lost victim should remain where he is until full daylight.

A compass is an essential item but the compass carrier should realize that the compass itself will not get him back to civilization. It will only enable him to travel in a consistently straight direction.

Also important are matches, a knife, adequate clothing, and a lightweight but sizeable piece of yellow, red, or clear plastic, which can be used as a cover, rain cape, blanket, or even a signal panel.

But training is the essential thing — training in observing the terrain, sounds, the location of the stars, and the direction of the wind; training in use of map and compass; and training to give self-confidence and ability to care for oneself.

References

Berlyle, Milton K. *Safe Drinking Water in Emergencies.* Monticello, N.Y.: Rhulen Agency, Inc., 1966.

Handbook for Camp Directors and Administrators in a Girl Scout Council. New York: Girl Scouts of the USA, 1967.

Harris, Dorothy V. and Vander Smissen, Betty. *Campcraft.* Chicago: The Athletic Institute, 1965 (series 1), 1967 (series 2).

Rhulen Agency, Inc. *A Safe Horsebook Riding Program.* Monticello, N.Y.: The Agency, 1966. 4 pp.

———. *How to Control Rabbits, Squirrels, Skunks and Chipmunks.* Monticello, N.Y.: The Agency, 1966. 4 pp.

———. *How to Control Woodchucks, Moles, Porcupines, Bats and Snakes.* Monticello, N.Y.: The Agency, 1966. 6 pp.

———. *Is Your Camp Health Program Sick?* Parts I & II. Monticello, N.Y.: The Agency, 1966. 8 pp.

———. *Protecting Rustic and Unseasoned Wood from Injurious Insects.* Monticello, N.Y.: The Agency, 1966. 8 pp.

———. *The Camp Chauffeur · an Important Staff Member.* Monticello, N.Y.: The Agency, 1966. 12 pp.

Hiking and Mountaineering | JOHN M. MOREHEAD, B.S.

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This section is a guide for the person who is planning to lead a group on a hiking or mountaineering trip. A group leader is any person who leads or plans the activity, even for as small a group as one other individual. The intent here is to help the leader plan and conduct a safe, enjoyable outing experience in hiking and mountaineering.

HIKING

Definition

Actually, anyone who is walking for any recreational purpose could be called a hiker. For the purpose of this section, however, hiking means an activity where the hiking is the primary purpose of the outing, not a secondary means to an end in accomplishing some other sport. Walking or strolling for pleasure is considered hiking.

Scope of activity

As the population increases and available leisure time becomes greater, the trend is for the number of people actively engaging in hiking as an outdoor activity also to increase. The 1962 report to the President and Congress by the Outdoor Recreation Resources Review Commission, *Outdoor Recreation for America*, stated that between June 1, 1960, and May 30, 1961, the *average* American over 12 years old spent just under 18 days "walking for pleasure." As a recreational activity, measured by days of participation, walking for pleasure was second only to driving for pleasure, and was far more popular than any of the other listed sports and activities. The survey showed that 33% of all Americans engage in "walking for pleasure."

Hiking hazards

In the lower grades of difficulty in hiking, i.e., on walks or trails in normal terrain and weather, most hiking accidents are not severe. Blisters, strains, sprains, abrasions, and an occasional broken bone are the most common injuries. The frequency rate for accidents is far below that of contact sports or some of the other action oriented sports. This, in itself, certainly contributes to the popularity of the sport.

Climate. Climate can be a significant hazard to the participant. The main factors involved are temperature and altitude.

Cold: It is obvious that if a hike is planned for a cold, stormy day, adequate clothing must be taken. It should be the *leader's* responsibility to check this beforehand, to insure that every participant complies. In many instances, especially with young people or children, it is not enough simply to mention the needs beforehand. A check list or even a visual check before starting may be required. Numerous serious, and even fatal, accidents have occurred because of this oversight.

Heat: Heat may be a limiting factor in hiking. For older people, or for anyone with a weak heart, the problem of heat exhaustion or heat stroke can be most severe. It is essential that the leader know both the area, including the weather factors, and also the people involved in the hike. If a person is planning a hike for a young, athletic group from the immediate vicinity, he should have no problem in estimating the physical limitations of the group. Too often, however, this same hike may be proposed for an unknown group which may not be accustomed to the climate of the area. This happens quite commonly in youth and summer camp groups. A hike should be planned for the slower or weaker individuals, not for the strongest. It is easy to extend most hikes with side trips or with the introduction of other activities, but it is most difficult to extend safely the physical capabilities of an exhausted individual.

Altitude: In some areas of the country, the altitude is the most limiting of all the climatic factors affecting recreation. To plan a strenuous hike, or any other strenuous activity, for a person who is not acclimated is completely foolhardy. Again, the leader must know his group, as well as the area.

Equipment. Up to this point, hazards indigenous to the environment have been discussed. Additional safety problems, related more to the individual, are also present. As in other sports, the equipment of each individual is an important aspect affecting the safety of the activity.

Obviously, a most important item of equipment in hiking is the footgear. Unfortunately, there is no perfect solution to this potential hazard. The type of footgear can properly vary with the physical make-up of the individual, usage, local terrain, local climate and weather, amount the individual is willing to spend, etc. In all cases, the leader should assure himself that the footgear of all participants is adequate for the hike proposed. Nonslip soles should be stressed, if not required. The rubber cleated vibram type soles are excellent in most areas, but often a common rubber sole will do just as well. Ankle support should be given far more attention than it usually receives. Many professionals contend (although there are no statistics to prove this) that the rate of ankle strains and sprains is far higher for those hikers wearing sneakers or tennis shoes than for those wearing high top leather shoes or boots. It is quite obvious that the high top leather does offer more physical support. In spite of this, tennis and other canvas type shoes are usually acceptable on most hiking outings, simply because they generally have an excellent nonslip sole. On hiking trips of several days, ankle support becomes critical. A boot or hiking shoe should be almost mandatory.

Conditioning. The physical condition and the training or experience of the individual are not as easy to solve as the equipment problem. It would be wonderful if one had the time and opportunity to train and condition the participants before leading a hike. The only solution is to tailor the hike to safely accommodate the participants. By picking level or easy terrain, shorter distances, etc., an experienced leader can adjust the activity to safely fit the needs of those involved.

Training. It is a surprise to many that there is a real skill involved in hiking, even on level ground or trails. Most people find that hiking, even for relatively short distances, can be quite fatiguing. It is interesting, therefore, to note that most inexperienced people hike differently from the way they walk. Have you ever really watched a group of hikers go by? In most cases, you will find that they are mimicking what they feel a good hiker should look like. Be objective and carefully observant the next time you see a group of scouts on a hike. You will notice, in most cases, that the boys are walking with long, springy strides and are proceeding faster than a normal walk. These reactions are typical of all inexperienced hikers, not just Boy Scouts.

Most people, including leaders, feel that they have to walk faster than normal when they hike. Most feel you must take long strides. These long strides probably account for the majority of strained hip and thigh muscles. The springy step? How many people normally walk with the greater part of their body weight on the ball of their foot? Very few. No wonder calves get cramped and ankle tendons get sore. The secret of good hiking technique is to relax. Cover the ground in a normal and relaxed manner with as little expended energy as possible. As with the tortoise and the hare, a slow, relaxed, steady pace is far better in the long run than the flashy, fast, and springy stride most beginners assume.

How many leaders teach this? Most of the emphasis in hiking is on the distance covered. The questions first asked are, "How far did you go?" and "How fast?" For safety, greater emphasis must be placed on finishing the hike in good condition, rather than on seeing how many miles it takes to cripple the group.

Off-trail or rugged terrain. In essence, all the hazards and techniques mentioned before are present, and even magnified, when a hiking group leaves the trail and/or enters rough terrain. Because of the terrain, there are additional safety hazards. Rough country can contribute to the danger of falls, sprained ankles, broken legs, cuts and bruises from branches, rashes from poisonous plants, and bites and stings from animals and insects.

The leader should consider and plan for all of these contingencies *before* the group starts. Make sure all necessary equipment is taken along, especially in the area of first aid gear. Make sure the group is physically and mentally prepared for the rough going; hiking becomes more difficult in rough terrain. A very excellent and complete coverage of the technique of rough country hiking may be found in the mountaineering book, *Mountaineering — The Freedom of the Hills*, by the Seattle Mountaineers. Under the section on "Wilderness Travel," this book describes the elements of foot placement in various types of rough terrain and several other techniques and methods of hiking ascent and descent.

Probably the most important phase of the entire coverage is the portion describing the "lock" step or "rest" step. In essence, this technique calls for a slow ascending pace, where, on each step forward, the lower knee is straightened and momentarily "locked" so that the weight of the body is supported on the bone structure, rather than by muscle power. This allows for the muscles of the advanced leg and the back to be very briefly relaxed and rested during a portion of each step. Although sounding quite complex in writing, this rest step is quite simple to learn, and can make a tremendous difference in any person's performance in hiking activities. At high altitudes, the rest step is even more important; because of the lack of oxygen in the air, a hiker must move more slowly to allow his body time to assimilate what oxygen is provided. The rest step allows this to be done without excessive muscle fatigue.

Maintaining location. Certainly one of the most publicized hazards of off-trail hiking is that of getting lost. Most beginning hikers have heard and read so many conflicting stories about this matter that they are almost overwhelmed by the choice of methods which can be used to avoid getting lost. Everyone can recall several favorites: staying put, lining up tree trunks to avoid circling, looking for moss on the north side of tree trunks, following a stream downhill, using a watch for a compass, and numerous others. In the exactly right location and time, each one of these may be perfect. It is vital that a hiking leader be aware of the limitations of each method considered for use, as well as its good points. The problem of getting lost, however, still remains a very real threat that should be planned for in advance.

The best way to avoid getting lost is never to leave the trail. Once a group has decided to do some off-trail hiking, however, other measures are called for. A map and a compass are excellent, but they are only as good as the people using them. If a person cannot orient himself to find his location, this immediately negates the value of the map. A compass is an excellent tool to use to maintain a constant direction of travel. This is also dependent on the person's knowing which direction he wants to travel. The real key in the entire problem is to avoid getting lost in the first place. If a leader is aware at all times of his location, he should know the direction to travel to get back.

As indicated before, many people become lost even while carrying a map and compass. The trick is to start using the map and compass *before* you become lost. When you leave a trail, for example, take note of your map location and the compass direction in which you are heading. If there are major changes in direction, note them. Estimate distances traveled. All of this should give you a good picture of the distance and direction to be followed to return to your initial starting point.

The above actually seems almost too obvious to mention, until you actually see someone become lost in spite of a map and compass. Because so many people carry a map and compass only for use *after* they become lost, these items are almost danger, rather than safety, devices. For an interesting surprise exercise, take an unknowing group out into rough country and, without pre-warning, see how many can locate themselves on the map and give a compass reading back to the starting point. This will perhaps prove a needed point.

Landmarks are good only if they can be used to orient a person and indicate the direction to travel to safety. In mountainous areas, landmarks can be excellent guides to the observant hiker. Even with these excellent guides, it is very common for people to b[illegible] lost simply because the landmarks the[illegible] an nothing to them. The Indians are c[illegible] with saying that one of the traits of the w[illegible]e man is that he never looks back to see the country he has just been through (and may want to return to). Instead, the white man plows blindly ahead until he becomes lost. This is too often true. When leaving the trail, be *observant*. If there is a landmark in sight, remember it and its location in reference to your starting point. Think and look for reference points which can serve as guides. Again, test your group. As a surpise move, ask individuals what landmarks they would use to show their location or to indicate the return direction.

Of course, there are many areas of the country where landmarks simply cannot be seen. This may be because of flat country, heavy timber, or other reasons. Above anything else, being *observant* is the key to avoid becoming lost. Note the position of the sun, the direction of the streams, the moss on the trees, or anything else that will help you to keep your direction and to return to your starting point. All the hints you can think of, or have read about, are valid as long as they are used to *avoid* becoming lost, rather than used after the fact. Certainly, one of the greatest contributions a hiking leader can make in the way of safety is to teach all individuals of each group the skills needed to avoid becoming lost.

Responsibility of the hiking leader

Plan the outing

Know the participants. Know their physical and mental limitations and capabilities.

Know the area. Be aware of terrain, distances involved, difficulties and hazards, also the local climate and weather conditions.

Notify group of needs. Notify the group in advance of any special training or equipment needed for the particular outing.

Supervise the group

Control the group. Probably the most dangerous group in hiking is the group of young people with a group *advisor* rather than a *supervisor.* This often results in an uncontrolled group where individuals are leaving the main party, wandering off the trail, exploring on their own, and racing ahead or lagging behind. This is too often the type of group that gets completely to its destination before someone raises the ominous question, "Hey, has anyone seen Johnny lately?" Control of a hiking group is just as important as the control of a swimming group and can often be handled in the same manner. A buddy system, especially for younger hikers, is an excellent accident prevention measure.

Usually the hiking leader will lead at the front of the group. Someone, usually the next most qualified individual, should be appointed to bring up the rear of the party. This person can help stragglers or handle small accidents, problems, or equipment malfunctions before they develop into serious situations. No one should be permitted to leave the group, and periodic checks should be made to see that everyone is present.

Teach safe hiking techniques and practices. The leader should explain and teach the safe techniques and practices of hiking, including not only the physical skills, but also the proper mental approach. This will not only help to prevent accidents on each particular outing, but will also help to prevent accidents when the individual hikes in the future.

Teach enjoyment of secondary values. As a direct effort to help prevent accidents in hiking, a leader should branch out into other fields of interest. Many of the accidents now occurring are a direct result of the emphasis on competitive hiking. To prevent "how far" and "how fast" from becoming the only goals of hiking as a sport, more emphasis should be placed on other values. The subject of *environmental awareness* is rapidly becoming one of the most important fields of study in our country. By the introduction of ecology or another form of nature study, a leader can certainly provide a more relaxed and safer hiking experience as well as a more enjoyable one. Environmental awareness should be one of the major objectives.

Provide for safety of group

Prevent accidents. This is, of course, a responsibility of the leader. Checking equipment, planning for the specific group, maintaining constant group control, using a buddy system, having a tail-end supervisor, not over-extending the group, preventing getting lost, etc., are techniques that should be used to prevent accidents.

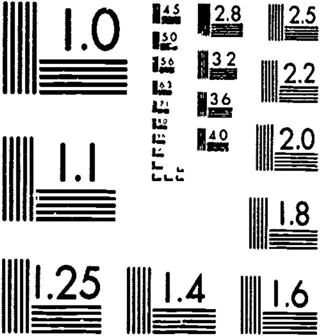
Plan for potential accidents. Even with due care, there is always the possibility that an accident might occur. There are a few basic procedures that should be followed to plan in advance of an accident. First, the leader should carry enough equipment to handle an injured person. This goes beyond the mandatory first aid kit. If a person in the group is injured at the furthest point of the hike, what can you do? The leader should have enough clothing or covering to protect the injured until he can be properly taken care of. Depending on the area and the climate, a leader may want to take along extra water, extra clothing, a sleeping bag, or other similar items. The newly introduced space blankets are proving to be excellent back-up items for emergencies such as this. Probably too much emphasis has been placed on carrying extra food. Extra food is excellent, of course, but it should be remembered that a person will die far quicker from exposure than from starvation. Enough food, especially high energy food, should be carried so the delayed or injured person will not lose heat or body energy. Concentrated food bars are excellent for this purpose. These can be ordered from most mountaineering suppliers, and from many of the large sporting good companies.

In any event, a leader should be sure that enough equipment is carried to handle an emergency. Most beginners overdo this; experienced hikers know how little they can get by on.

MOUNTAINEERING

Definition

Mountaineering specifically differs from hiking in that special equipment (ropes, pitons, ice axes, crampons) is needed for negotiating difficult terrain. Much of mountaineering may involve hiking, but when the special equipment



ICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

is in use, then it is considered to be mountaineering.

Scope of activity

Mountaineering may be participated in at varying levels of difficulty. At the lower, safer level, one could be walking up a steep slope, using a rope as a safety back-up only. At the higher levels of difficulty are such things as the extreme grades of technical rock climbing or some of the high altitude expedition climbing.

The hazards of the more difficult levels of mountaineering are conspicuous and well publicized. On a participant/hour ratio, this is certainly one of the most dangerous popular sports.

At the present time, there are no accurate figures available to indicate how many Americans actually engage in mountaineering as a recreational activity. Undoubtedly, the percentage is small compared to many other sports.

Mountaineering hazards

General discussion. To remove the hazards of the rock or of the mountain would destroy the sport. The only practical way to reduce the accident rate in mountaineering is to increase the skill and knowledge of the participants.

As in many other recreational activities, the accident rate is considerably higher in the beginning or novice class than in the expert class. Beginning or inexperienced mountaineers have far more accidents per hour of participation than the skilled mountaineers, even though the latter are participating on more difficult and potentially more dangerous terrain. Therefore training, conditioning, and experience are the primary means to improve safety in mountaineering activities, especially if the training and conditioning are offered to the beginner.

Mountaineering is a very complex and diversified activity. Entirely different techniques may be called for in different areas, depending on the type of rock, altitude, weather, length of the climb, party members, and whether the surface is rock, snow, or ice.

Reference sources. There are several good instruction and reference books on mountaineering. Some of the best are:

Belaying the Leader — An Omnibus of Climbing Safety. San Francisco: Sierra Club, 1956.

Henderson, Kenneth H. *Handbook of American Mountaineering.* Boston: Houghton Mifflin Co., 1942.

Mandolf, Henry (ed.). *Basic Mountaineering.* San Diego: San Diego Chapter of the Sierra Club, 1961.

Mountaineering — The Freedom of the Hills. Seattle: The Mountaineers, 1960.

Rebuffat, Gaston. *On Snow and Rock.* Translated by E. Brockett. New York: Oxford University Press, Inc., 1967.

Styles, Showell. *Men and Mountaineering.* New York: David White Co., 1968.

Wexler, Arnold. Theory of belaying. *Sierra Club Bulletin.* San Francisco: Sierra Club, Dec. 1947.

Wheelock, Walt. *Ropes, Knots, and Slings for Climbers.* rev. ed. Glendale, Calif.: La Siesta Press, 1967.

Training sources. Training in mountaineering can be obtained from numerous sources. Many colleges and universities now have hiking clubs that offer at least an introduction to mountaineering. Some go on into instruction in the advanced and technical aspects as well. Many conservation organizations have mountaineering groups that offer instruction and many cities or regions have specific mountaineering clubs that also offer instruction. Examples of just a few of these are: Sierra Club, Mountain Rescue Association (Pacific Northwest), Colorado Mountain Club, and the Appalachian Mountain Club. Other groups and schools are now teaching mountaineering; the "Outward Bound" type of school is an example.

There should be no real difficulty for the interested person or group to arrange for some sort of mountaineering instruction. Extreme care should be taken to assure that the quality of the instruction is sufficiently high. Certain mountaineering training schools have outstandingly safe records. Others do not. This should be thoroughly investigated before the instruction is received. Poor or incomplete training in this sport can be far more dangerous than no training at all.

Summary. If an individual or a group wants to participate in mountaineering activities, proper training is mandatory. The group leader, again, should be completely satisfied that the members are properly equipped, have proper training, are in good physical and mental condition, and have a complete knowledge of the area and the hazards that they are most likely to encounter while mountaineering.

Most mountaineering organizations have a series of qualifying standards that must be met before a person is judged a competent leader. Even more than in hiking, it is imperative that this leader maintain complete control over the group. A mountaineering activity without sufficient, well qualified leadership should not even be considered.

REGISTRATION

Registration of hiking or mountaineering activities is frowned on by some as an invasion of personal rights; their point is valid. However, if you as an individual are responsible for the safety of a group of people or are responsible for the safety of all persons entering a specific area (a park would be an example), then registration in some form or another is a hazard prevention technique to be considered.

Registration definitely can reduce the safety hazards of hiking or mountaineering. Registration alone cannot, in most cases, actually prevent the accidents from happening. It can, however, significantly cut down the hazard of having a small accident develop into a major tragedy because of a lack of immediate help or a prolonged rescue time.

Registration can take many forms. It may be voluntary or mandatory, it can even include an equipment check or a check of the qualifications and experience of the group. Some groups or areas require registration for anyone leaving the marked trails. This certainly has helped in locating lost people, and in assisting the rescue parties to locate injured victims. The most extreme registration system in this particular field occurs in the sign out of technical mountain climbers in highly hazardous areas. Some of the National Parks are good examples of this. Each climber is required to register, giving his proposed climb and expected return. Before starting the climb, his equipment and his past climbing experience are checked. This, of course, requires that the person doing the checking be an experienced and knowledgeable climber. In some areas a climber may be refused permission to climb a particular route or peak if he does not qualify or if his equipment does not meet the requirements. Usually an easier climb is recommended as an alternate. Many mountaineering clubs have similar checkouts for their own members.

There is no doubt that this type of control is effective in preventing accidents. There is also no doubt that this does affect, in some degree, the rights of an individual. Each leader of a group or organization, or each person with the responsibility for the management of an area, will have to decide on the merits of registration. In some cases, it has been an effective tool in prevention of accidents; in others, it is probably more of an administrative control rather than a real safety measure.

Bicycling | JEAN SANFORD REPLINGER, M.S.

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Bicycling in the United States has increased markedly over recent years. The Athletic Institute of America calls it America's No. 1 participation sport, with 61 million pedal pushers in our country in 1968. In a survey of patterns of summer outdoor recreation, gathered by the Bureau of the Census for the Bureau of Outdoor Recreation from June through August 1965, cycling topped the list in terms of "units of participation," which was expressed as 19 billion "occasions." Cycling ranked fifth in popularity, trailing driving, swimming, walking, and outdoor games. The figures indicate that it has grown 105% between 1960 and 1965. It is predicted that there will be a 137% increase between 1960 and 1980.

Accidents and Safety Programs

The National Safety Council states that a sound safety program must be based upon accident statistics and exposure data. However, very few programs have been developed with such data in mind. In the case of bicycle safety, the Council found that most statistics lacked details needed for designing educational programs which would deal with primary and secondary factors related to bicycle accidents.

In a 1956 Metropolitan Life Insurance Company study of 151 industrial policyholders who were killed in bicycle accidents, males accounted for 10 times as many deaths as females, and half of the male fatalities were in the age interval of 10 to 14 years.[1] Perhaps there are more miles per rider accumulated by males and more use of bicycles by male youths.

The 1968 edition of *Accident Facts*, published by the National Safety Council, disclosed some information on the age distribution factor in accidents including "lives lost" and injuries as a result of motor vehicle and bicycle accidents; however, there was no differentiation between the bicyclist or the motor vehicle occupant. Seemingly significant conclusions were that the ages 5 to 14 have the highest death incidence and school grades 4 to 6 (generally ages 9 to 11) have the highest incidence of accidents.

Bicycle Owners

According to the Bicycle Institute of America, in 1969 there were 63 million bike owners in America, of which 38 million were active cyclists. These owners range in age from 5 to 75. The bike is popular not only with elementary

[1] F. J. Vilardo, M. J. Nicol, and H. E. Heldreth, An investigation into bicycle usage. Mimeographed (Chicago: National Safety Council, 1969).

school children, but with college students hemmed in by campus parking restrictions, and with parents eager to trim their waistlines or to invest in some physiological insurance for the circulatory systems of advancing age.

One in seven Americans (15% of the population) has a bicycle of some kind. About 88% of the users have bikes with adult frames, yet 25% of the market seems to be children and youths under the age of 15.

Figure 1. In Oberlin, Ohio, nearly everybody rides a bicycle, as indicated by this senior citizen pedaling past the college.

ACCIDENTS — CAUSATION AND PREVENTION

Cycling proficiency is related to basic movement ability, and this in turn is related to movement and judgment experience applied to traffic predictability and uncertainties.

In using a bicycle properly, discretion and judgment have to be superimposed upon some fairly sophisticated though basic kinesthetic responses. Yet, large numbers of bicyclists are at that time of physical growth and personal maturation when motor skills are still adjusting and readjusting to growth spurts. Very basic and important is the preventive part of cycle safety inherent in basic movement activities such as stunts and tumbling, running, jumping, dodging, balancing, pushing, and pulling.

In addition, there is a real progression in bicycle skill achievement. On the open highway or busy street the demands of cycling cannot accommodate anything but the best of skill. When should a cyclist be allowed to cycle in certain areas?

Accident facts are elusive but enlightening. In a 1962 study in Kansas City, Missouri in which only bicycle-motor vehicle accidents to children aged 5 through 16 were investigated and correlated with the results of a 1958 investigation of bicycle accidents by the National Safety Council, the main violations found were not yielding the right-of-way, improper turning, disregarding stop signs or signals, riding in the center of the street, and riding against traffic.[2]

More specifically, the National Safety Council study showed that:

1. Two out of every three bicycle accidents occur to riders who have failed to follow the rules of the road.
2. One out of every five bikes involved in these accidents was mechanically defective in some way.
3. One out of four auto-bike accidents was caused by the motorist.

One of the difficulties with plotting a safety education program based on bicycle accident statistics and analysis is that the various surveys include certain kinds of accidents or certain segments of the population of bicycle users which are not directly comparable. Some of these statistics are helpful, but at the same time they are apt to give an inaccurate emphasis because of incompleteness. Use of common sense will make for greater validity until we have statistics to support or reject suppositions. In any event, the loss of life and the number of injuries, sure to increase with growth of the activity, indicate that community leaders must assume some responsibility for designing and carrying out a safety program for cyclists and for those who educate or influence cyclists.

Assumption of responsibility

Children and adults, cyclists and motorists, must know and obey the rules of the road, and operate their vehicles safely. Ironically, parents who would never think of allowing their sons and daughters to drive the family car without adequate instruction will often turn a youngster loose on a bike without precautions.

Parents have a significant responsibility in purchasing the right bicycle and in supervising its use. School and youth leaders can supplement, but not replace, this responsibility. The cyclist must learn to consider himself as important as the driver of a car; the *predictability* of the cyclist to the driver, and vice versa, is extremely important.

As we increase our knowledge about what goes into good driving, we find that *visibility* is a significant safety factor. The cyclist's clothing, and anything else in line with traffic patterns, must be made visible. At no time must the cyclist feel complacently safe. Just as a driver must drive defensively, so must a cyclist ride defensively, knowing at all times where and how to escape imminent dangers.

The problem of assuring maximum safety for the nation's 60 million bicycle riders is a challenge that is being met with better results all the time. Even though the number of cyclists has risen to new heights in recent years, the accident rate among those cycling for health, recreation, and fun has been kept in check. There is, however, need for improvement.

The remarkable strides already made have resulted in large measure from the voluntary efforts of public spirited men and women everywhere who have worked tirelessly to achieve greater safety in their communities. Teachers, civic leaders, school officials, police authorities, recreation officials, and many others have cooperated in advancing knowledge of bicycle safety, but there is a need for increased efforts.

In promoting bicycle safety, there are methods other than the "scare" approach. Some feel this to have been less successful than that which recognizes that cycling can be made safer by:

1. proper selection of cycle for the rider
2. proper and continuous care of the bicycle
3. a knowledge and practice of correct riding rules, including rules of the road and rules for cycle performance
4. instruction in safe operation, periodic inspections, and skill proficiency tests.

[2] F. J. Vilardo et al., *op. cit.*

BICYCLES

Selection

The wise selection of a bicycle depends on the use of the bicycle and size and ability of the rider. Bicycles may be classified as utility, lightweight, touring, and racing types. The utility bike is the heaviest, about 40 to 50 pounds. It is good for the beginner and will stand up under a fair amount of weight, irregularity of terrain, and abuse without as much need for sensitive repair and replacement as other types. The lightweight bike, which weighs from 25 to 35 pounds, is equally strong in terms of weight, usually has handbrakes which are a little more complicated to use, and has smaller tires. The touring bike is for those who like to let the wind rush past hair and cheeks as they enjoy the countryside at a leisurely speed. It has special tires and a derailleur system of from 5 to 15 speeds. The racing bike is seldom used for anything else, and for track racing has no brakes or gears.

Within these classifications, there are many styles from which one can choose, and with time there undoubtedly will be additions. There are the high riser, the middleweight, the minibike, the derailleur, and a variety of others such as the tandem, unicycle, adult triwheeler. Any bicycle dealer can discuss the differences. According to estimates of the Bicycle Institute of America, 1967 sales totaled 6.288 million bicycles including 3.150 million middleweights, 2.223 million high rise, and 915,000 lightweights.[3]

The lightweight bicycle with wide-range derailleur gearing, toe clips, metal pedals, and dropped pattern handlebars is recommended for all-around cycling, except for purely local travel in flat terrains, both for male and female riders. This type is selected because of the greater ease of propulsion and of steering, improved weight distribution, and effective use of the rider's energy. Proper fitting of the bicycle is of paramount importance when it is used for long, continued stretches. The saddle must be properly angled and positioned, and both the saddle and its user well "broken in."

The middleweight, which weighs about 40 pounds, has a raised handlebar, wide saddle, sturdy tires, and steel fenders. In boys' and girls' models, it is the bicycle for the utility cyclist who uses the machine for shopping, errands, and for short trips, but is not the best for long rides over hilly country. It commonly is equipped with a front basket, rear carrier, chain guard, and a generator for a light.

The 10-speed derailleur bicycle comes almost exclusively in boys' models, and is the bicycle for the pleasure cyclist. Weighing less than 30 pounds, it has dropped handlebars, a narrow saddle, and light tires. It has no fenders nor does it ordinarily have a carrier or a light.

Middleweights and 10-speed lightweights are different not only in weight and gearing but also in the manner of riding. Since the rider sits upright on the high rise and standard middleweights, a fairly wide saddle is needed. On a 10-speed lightweight, the rider leans forward transferring part of the weight to the arms; therefore, a narrow saddle can be used which reduces chafing, and which in the long run gives more efficiency, easier pedaling, and greater comfort.

Checking fit of the bicycle

Bicycles are measured by the height of the frame, that is, the distance between the bottom axle and the point where the seat post enters the frame. Sizes range from 19 to 24 inches. The frame size, forward reach, and saddle, next to body position, are most important for "comfort." On the 10-speed bicycle the forward reach is adjustable through the handlebar extension or gooseneck. Individuals with short arms need a short gooseneck, and vice versa. A rough measure of forward reach is the distance between the peak of the saddle and the handlebar.

[3] Letter from John Auerbach, Executive Director of Bicycle Institute of America, to Harold E. Heldreth, National Safety Council, Aug. 21, 1968.

This distance should be about the same as the distance from the tip of the elbow to the tips of the fingers. On a standard bicycle, the saddle should be on a horizontal line with the top of the handlebar, and the saddle itself should be horizontal. To soften a new saddle, rub it vigorously with an emolient. Changing the height of bike saddles and banana seats is simply done with a bicycle wrench.

When sitting on the saddle with one pedal all the way down, the rider should be able to rest the ball of the foot on the pedal with only a slight bend in the knee. Sometimes adjustment in the seat can accommodate this fit; other times it requires a bicycle with a larger or smaller frame. In raising the seat, the saddle should never be raised so high that there is less than three inches of post extending down into the frame; otherwise, the seat will be insecurely positioned. If that becomes necessary, the bike has been outgrown and should be replaced with one with a larger frame.

Care of the bicycle

The importance of having a bicycle in good mechanical condition and properly equipped must be constantly stressed, and parents should insist upon this by regularly going over a bicycle inspection check chart with their youngsters. Also, the cycle should be taken to a local serviceman for inspection at least twice a year. Items to be checked are shown in Table 1 on p. 288.

Bicycles when purchased should have all the safety accessories prescribed by law. Proper lighting should be required, such as headlamps, and reflectors on the rear fender of every bicycle with or without a tail lamp, unless the lens of the lamp is properly designed to reflect light. The front light should be visible from a distance of 500 feet; the rear reflector from 300 feet. The coloring of a bicycle, particularly its rear fender, has an important effect upon its visibility; light colored paint is desirable. It is possible to apply white or other light colors on the rear fenders of darkly painted bicycles for decorative purposes. Reflection tape can be effective in increasing bike visibility.

Brakes should be able to skid the rear wheels upon a dry, clean pavement. Many bikes are not equipped with proper warning devices. Wheels and spokes, steering bar and front fork sprocket and chain, pedals and mudguards often are found in poor condition.

A bicycle will give many years of service, provided it is handled with respect. Preventive maintenance including cleaning and oiling is simple. Keep the bike clean by wiping it with a dry cloth; at least once a month apply a good automobile wax on paint and chrome. If not stainless steel the spokes will rust in spite of the best of efforts. Prevent scratches by not leaning the bike against brick walls. When the bike must be laid flat, always rest it on the side away from the derailleur. In the garage, hang it on hooks.

At least once a month, oil the chain. Brake cables, wheel bearings, and pedal bearings need occasional greasing. If the owner is not mechanically inclined, any bicycle shop will give the cycle a complete check-up for a nominal charge. This should be done at least once a year.

RIDING RULES AND TECHNIQUES

Traffic regulations for bikes vary from state to state, and sometimes from town to town within a state. Generally, bicycles are considered vehicles, and are subject to the same regulations which govern cars and trucks. The safety officer of a school or the police department can summarize the laws of the community.

Rules and techniques

Here are 12 basic rules of the road developed by the Bicycle Institute of America; bike riders should know them all.

1. Obey all traffic regulations, signs, and lights.

2. Keep to the right and ride in a straight line. Always ride single file.
3. Have a white light in front and a red light or state approved reflector in back.
4. Have a working signaling device, such as a horn or bell.
5. Give pedestrians the right-of-way. Avoid sidewalk riding.
6. Look out for parked cars pulling into traffic. Watch for doors opening on parked cars.
7. Never hitch onto other vehicles, stunt, or race in traffic.
8. Carry no passengers or objects which interfere with vision or control.
9. Make sure brakes are functioning smoothly. Keep your bike in perfect operating condition.
10. Look to the right and left at all intersections.
11. Always use proper hand signals for turning or stopping.
12. Don't weave in and out of traffic or swerve from side to side.

The novice cyclist should ride slowly until accustomed to the exercise and the muscles are limbered. More pressure should not be used with one leg than with the other; rhythm is what counts. To ride properly and with the least effort, the ball of the foot should be on the pedal and knees should be kept close to the frame.

The shoulders should not be allowed to wobble, as that makes the bicycle unsteady. Look straight ahead, holding the head still and the handlebars naturally. Don't try to pump up steep hills. Dismount and walk up unless you have an American lightweight with gearshift, in which case the bike can be shifted into low gear. Low gears require the feet to go around rapidly but without much pressure.

To change gears, wait until the feet are spinning well, keep spinning, let up on the pedal pressure, and shift. If gears are shifted while pushing, the teeth on the newly engaged sprocket may be snapped. A bicyclist should shift just before needing the new gear; this will result in a steady rhythm that insures smooth cycling.

In gaining control, one should learn to ride straight no matter how steep the hill or strong the wind. The cyclist should fix his eyes on the road. One should watch for potholes and refrain from weaving or wobbling. A straight riding cyclist is a pleasure to behold; a wobbly cyclist is a menace. Until one is steady, he should confine riding to driveways and parking lots.

To ride masterfully is to ride defensively. Assuming that the bicycle is mechanically safe, that the rider knows how to control it, and that he rides in a safe manner, he must be alert to errors made by pedestrians and other road users. The cyclist should be alert for the sounds of impending motion changes such as the change in the sound of an automobile exhaust, the rumble of tires or engines, sounds from the road, side, or from around the corner ahead. When riding alongside parked cars, he should be alert for passengers who may open doors in his path. Attention should be given to watching the wheels of cars approaching, and cars on either side. The wheels should start to turn before the vehicle begins its turn in your direction. This gives an important little bit of extra time to take action needed.

BICYCLE TOURING

For a vacation tour by bicycle, preliminary planning and preparation pay handsome dividends. Route planning is fun; it builds anticipation and enthusiasm. At the moderate pace of cycle touring, one is more closely "tuned in" on the countryside than by almost any other form of travel.

While an automobile road map may suffice

TABLE 1

MODEL INSPECTION FORM

Bicycle Make & Model .... Serial No. ....
License No. .... Owner's Name ....
Address ....
SIZE — Fit of bicycle to rider: Test saddle for level, tightness .... OK..........
Frame — Can rider straddle frame with both feet flat on ground? .... OK..........
Saddle Height — Can rider straighten leg when seated on saddle with one heel on low pedal? .... OK..........
FRAME — All tubes in line, not kinked or misaligned .... OK..........
Front Fork — In good condition, not bent backward, sideward .... OK..........
Bearing Adjustment, Front Fork: Needs adjustment .... OK..........
No looseness, binding, or "rough spots" when rotated .... OK..........
Bearing Adjustment, Pedal Crank Hanger: Needs adjustment .... OK..........
No shake, looseness, or binding .... OK..........
PEDALS — Bearing adjustment: No shake or bind .... OK..........
Pedals intact and tight .... OK..........
Treads intact and tight .... OK..........
HANDLE BARS — In line with wheel and symmetrical .... OK..........
Height below rider's shoulder level .... OK..........
Tightly fitted, both against horizontal and vertical rotation .... OK..........
Tubing ends plugged .... OK .... Grips tight .... OK..........
FRONT WHEEL — Runs true, side to side and round .... OK..........
Adjust .... OK..........
Spokes: Repairs needed .... OK..........
Rim: not dented or kinked .... OK .... Bearings .... OK..........
Tire: Properly seated .... OK .... Tread .... OK..........
Wheel centered in fork .... OK..........
REAR WHEEL — Runs true side to side and round .... OK..........
Spokes .... OK..........
Uniform spoke tension .... OK .... Repairs needed .... OK..........
Bearings: No looseness or bind .... OK .... Adjustments .... OK..........
Backpedaling Brake (operates within 20° motion) .... OK..........
Tires inflated properly with good tread .... OK..........
CHAIN — Tension correct (½" play, no excessive looseness) .... OK..........
Sprocket teeth chain fit well .... OK .... Chain condition .... OK..........
BRAKES — Hand: Sufficient reserve at level when engaged? Adjust .... OK..........
Cable: No frayed ends, cable is taut .... OK..........
Brake shoes: Nuts tight? Adjust .... OK..........
At least 3/16" rubber thickness. Replace .... OK..........
OPERATING TEST EACH BRAKE SEPARATELY — Front .... OK..........
(Must hold well without catching) Rear .... OK..........
SADDLE — Is saddle tight and in good condition? Adjust .... OK..........
REFLECTOR — Does size conform to local requirements, if any? .... OK..........
LIGHTS — Battery and bulb satisfactory? Generator operative .... OK..........
WARNING DEVICE — Operative and audible .... OK..........
REMARKS ....

Inspector's Name ....

THIS BICYCLE ☐ APPROVED FOR NIGHT RIDING ☐ NOT APPROVED FOR NIGHT RIDING

BICYCLE INSPECTION CHECK CHART

Item Inspected	Lubricate	Tighten	Adjust	Repair Replace	Approved	Item Inspected	Lubricate	Tighten	Adjust	Repair Replace	Approved
Frame Tubes	■	■	■			Wheel Nuts — F & R	■		■		
Fork Blades True	■	■	■			Wheel Bearings		■			
Handlebar Tight	■					Hub — Rear Bearings		■			
Extension Tight	■					Brake Operation					
Grips Tight	■					Tire Condition F & R	■				
Bar Height, Angle	■					Rims F & R	■	■			
Saddle Height, Angle	■					Spokes F & R	■				
Seat Post	■					Tire Inflation	■	■		■	
Fit — Bicycle	■										
						Hand Brakes					
Steering Head						Brake & Gear Cables					
Crank Bearings						Brake & Gear Levers					
Cranks, Cotters	■		■								
Drive Sprocket	■		■			Gear Shifter					
Driven Sprocket	■										
Chain						Speedometer					
Pedals (Complete)	■		■			Generator (Batteries)					
Pedal Bearings		■				Headlight	■				
						Tail Light	■				
Mudguards, Braces	■					Reflector	■				
Carriers	■					Signal Device	■				
Cleanliness 100%	■	■									
Date						Approved By					

SOURCE: The Bicycle Institute of America, Bicycle Safety Tests *(New York: The Institute, n.d.), pp. 7-8.*

for overall routing, it tends to direct one to the heavily traveled highway, ignoring the pleasant, lightly traveled local roads. It is on the secondary roads that cycling is most pleasant and that the noise and bustle of the highway is left behind. In the vicinity of major cities, larger scale metropolitan area maps may show the smaller routes. County maps of the area to be traversed show even more detail, and can usually be obtained from the county seat.

Coast and Geodetic Survey maps are obtainable for most sections of the country, and come in different scales for many areas on the ratio of one mile per inch. The C&GS maps include information on the ground contour, enabling the cyclist to plan his route to avoid steep hills if he desires, and in any case to be forewarned of difficult terrain. It may be easier to take a longer route along the valleys than to take a shorter road "across the grain" of the countryside. Yet the experienced rider, with an adequately geared machine, may desire the hilly routes because of their greater interest.

Equipment

Since rainy weather can be anticipated on a journey of two weeks or more, mudguards should be fitted to the bicycle, and a removable fender flap attached to the front fender in periods of actual rain to prevent wetting of lower legs and feet. To permit evening travel, a lightweight generator set also is fitted.

Many items of routine and emergency equipment can be spread among various members of the party in order to distribute the load. Clothing should include nylon windbreaker, sweater, long-sleeved shirt, slacks, scarf or cap, extra sneakers or shoes, pajamas, sweatshirt, and poncho; two sets of shorts and wash-wear short sleeve shirts; three sets underwear and socks. Personal items include camera and film, maps and compass, flashlight and extra batteries, notebook and pencil, wallet or money purse, suntan lotion, insect repellent, comb and brush, toothbrush and paste, face cloth and towel, small mirror, cosmetic and personal hygiene items including soap. Emergency items include first aid kit, small sewing kit, tire pump, [illegible] wrenches, adjustable crescent wrench, extra chain links, and wheel spokes (for front and back wheels), screwdriver, pocket knife, tube repair kit, extra brake cable, machine oil, friction tape, and a roll of wire.

A handlebar mounted front bag of adequate size, and a roomy saddle bag with side pockets or a pair of pannier bags suspended from a rear carrier, distributing weight between front and rear for stability, provide luggage space. If a carrier is used, it and the luggage it carries must be solidly mounted to avoid sway which can interfere with control of the bicycle and contribute to an accident.

FUTURE OF BIKEWAYS

Chief beneficiaries of bikeways have been youngsters pedaling to school, playgrounds, and recreational areas, and all individuals using well planned, marked routes. More metropolitan parks have arranged for Sunday bike riding than ever before in our history. Bike paths are increasingly important in national parks and resort areas.

Current Department of Interior plans call for some 200,000 miles of path and trail construction in the next decade, including 25 miles of bike paths for each 50,000 people in major urban areas. The National Park Service has established bicycle trails as part of such new park programs as the Fire Island National Seashore, the Sleeping Bear Dunes National Seashore, and the Tocks Island National Recreation Area.

There is much that can be done on the local level. Local parks, reservoirs, and other scenic and recreational areas can be surveyed to see how bike paths can be added, thus increasing their usefulness to the community. Abandoned rail and trolly beds can be converted at very low cost. Little trafficked streets can be designated as bikeways in and around our towns and cities, as has been done successfully in Homestead, Florida; Dayton, Ohio; Denver, Colorado; San Diego, California; Milwaukee, Wisconsin; and more than 200 other cities.

References

American Cycling. Oakland, Calif.: American Cycling Press. Annual.

Bicycle Institute of America, Inc. *Bicycle Films Catalog.* New York: The Institute. Annual. 16 pp.

———. *Bicycle Riding Clubs.* New York: The Institute, n.d. 72 pp.

———. *Bicycle Safety Tests.* New York: The Institute, n.d. 23 pp.

———. *Bike Ordinance in the Community.* New York: The Institute, n.d. 32 pp.

———. *Bike Racing on the Campus.* New York: The Institute, n.d. 36 pp.

———. *Bikeways.* New York: The Institute, n.d. 6 pp.

———. *What's All This Jazz About Bikeways?* New York: The Institute, n.d. 6 pp.

Hostel Guide and Handbook. New York: American Youth Hostels, 1970.

Information Sources

Aetna Life and Casualty Insurance Company (Safety), Hartford, Conn.

Amateur Bicycle League of America (Racing), 6411 Orchard St., Dearborn, Mich. 48126

American Association for Health, Physical Education, and Recreation (Physical Fitness), 1201 16th St., N.W., Washington, D.C. 20036

American Automobile Association (Safety), 1712 G St., N.W., Washington, D.C.

American Youth Hostels, Inc. (Trips and Maps), 20 W. 17 St., New York, N.Y. 10011

Bicycle Institute of America, Inc. (All Categories), 122 E. 42 St., New York, N.Y. 10017

Boy Scouts of America (Merit Badge), 2 Park Ave., New York, N.Y.

Employers Mutual Liability Insurance Company (Safety), Wausau, Wisc. 55401

Girl Scouts of U.S.A. (Merit Badge), 830 Third Ave., New York, N.Y. 10017

League of American Wheelmen (Clubs), 5118 Foster Ave., Chicago, Ill. 60630

Lumberman's Mutual Casualty Company (Safety), Mutual Insurance Bldg., Chicago, Ill. 60644

National 4-H Foundation (Programs and Safety), 7100 Connecticut Ave., N.W., Washington, D.C. 20015

National Safety Council (Safety), 425 N. Michigan Ave., Chicago, Ill. 60611

Standard Oil Company of New York (Safety), 150 E. 42 St., New York, N.Y. 10017

United States Junior Chamber of Commerce (Safety), Box 7, Tulsa, Okla. 74102

Recreational Motorcycling | A. E. "JOE" FLORIO, Ed.D.

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The use of motorcycles as a means of transportation, for touring and in sports activities, has reached a new peak of popularity in this country. "Although the motorcycle has been a popular form of motorized transportation and recreation in Europe and Asia for decades, its acceptance in this country is a fairly recent phenomenon."[1] The United States Bureau of Public Roads reports that the number of registered motorcycles rose from 412,000 in 1955 to nearly 596,000 in 1966. The Bureau estimates that at least one-half million more have been added to this number each successive year since 1966. It is estimated that an annual increase in new registrations will reach one million per year by 1970, and that there probably will be more than five million registered in that year. Experts predict that by 1975 some 10 million Americans will be operating two-wheel motor vehicles.

The motorcycle has become popular because of its low cost, the relative prosperity of the times, the large teenage population, the move to suburbia, and increased leisure time. This last factor has greatly influenced the development of recreational, trail, and sports cycling. The development of low cost, special geared trail machines allows fishermen, hunters, explorers, rock enthusiasts, and nature lovers to reach their destinations with the ease and speed only a helicopter could surpass. Many of these new, light, compact machines can be carried on a car bumper or in a station wagon, trailer, camper, or small boat, yet they can transport a rider and a heavy load over the roughest terrain.

Dangers of motorcycling

Although thousands of motorcyclists have enjoyed sports cycling without serious injury, a motorcycle is a potentially dangerous piece of equipment if used improperly. The following statistics bear this out. Motorcycle accidental deaths rose from 731 in 1960 to close to 2,000 in 1968. Fortunately, in recent years there has been a gradual decline in fatalities in spite of an increase in vehicles. In approximately 90% of motorcycle accidents, death or injury results. Collision with another motor vehicle is the predominate type of motorcycle accident. The great majority of accidental deaths are victims between the ages of 15 and 24. There is no question as to the appeal which the cycle has for the teenager and young adult.

The most frequent causes of motorcycle accidents are reckless driving, speeding, and failure to yield the right of way. Studies have also shown that motorcycle accidents are more the

[1] *Common Sense Tips for Safe Sportscycling* (Montecello, Calif.: Yamaha International Corp., 1967).

fault of automobile drivers than motorcyclists. Because many motorcycle accidents occur on weekends and during June, July, and August, it is fair to assume that most cycling is of a recreational nature.

Basic skills

Recreational cycling takes place in parks and on boulevards in our cities, and can be enjoyed on the trails of our forest preserves, state and national parks, and mountain terrain. Regardless of the type of motorcycling one does, the cyclist should be skilled, courteous, and sportsmanlike. The skilled driver has developed competencies that allow him to drive safely in all situations. Basic skills and knowledge necessary to ride safely include the following:

1. Care and maintenance of
   a. lights and horn
   b. tight nuts and bolts
   c. tires (properly inflated and proper tread)
   d. front and rear brakes
   e. chain (properly adjusted and lubricated)
   f. engine and transmission
   g. battery
2. Proper dress
   a. protective helmet (full helmet provides greatest protection)
   b. footwear — hightop boots or shoes with firm ankle support
   c. clothing — bright colors and heavy material such as leather provides greatest protection
   d. eye protection — goggles or face shield constructed of shatterproof material
   e. gloves — gauntlet type cuffs
3. Skills in
   a. operating the controls
   b. starting and stopping
   c. riding in various gear positions
   d. braking — front and rear
   e. turning and cornering
   f. giving signals — hand or mechanical
   g. driving on all kinds of road surfaces
   h. driving in all types of traffic situations
   i. following and overtaking
   j. maintaining proper lane position
   k. night driving, riding in adverse conditions and various wind conditions
   l. group riding

The preceding knowledge and skills, coupled with experience, can provide enjoyable recreational motorcycling.

Trail cycling is one of the most popular types of recreational or sports cycling. Riding on a paved surface is easier than riding on an unpaved trail. "Dirt" riding requires different techniques than "road" riding and requires different and heavier-duty equipment. Usually, the lightweight trail bikes are easier and safer to handle in dirt and sand than are the heavyweights. Trail bikes are different in that they have special tires with different tread design. They also have heavier-duty springs and suspension systems to accommodate the pounding they get from the rugged terrain. Handlebars are usually wider for greater steering leverage. Among the skills needed for trail riding are knowing how to ride in soft sand, mud, and up and down steep hills. Before one attempts serious trail riding, he should gain experience gradually in gentle terrain until he can handle the cycle under the various conditions he will encounter on an extended trail riding trip.

Additional tips for trailsters are:

1. Do not ride alone.
2. Check weather conditions.
3. Check with forest rangers.
4. Observe all conservation, fire, and litter regulations.
5. Obtain permission before riding on private property.
6. Respect signs, fences, and gates.
7. Respect all animal life, wild or domestic.
8. Respect a horse pack train or people on horseback; turn off your motor and wait until they have passed. Remember, their mounts are not as manageable as yours.
9. Avoid riding in areas which could be damaged by your vehicle, such as soft meadows, areas with loose topsoil, and par-

ticularly steep hillsides where erosion might occur.

10. Be careful with firearms and never shoot at game while astride the machine. It is not only dangerous, but it is illegal in many states.

11. When riding in forests or on grass covered lands, be sure a spark arrestor is attached to the exhaust system.

12. Respect restricted areas such as watersheds, high fire areas, and freshly seeded ranges.

These are only a few suggestions that can help make recreational motorcycling a safe and enjoyable experience. With thousands of miles of forests, mountains, beach, and desert to explore, the scope of this activity is virtually unlimited. All one needs are the proper skills and competencies required of any motorcyclist.

References

American Automobile Association. *Motorcycles and Their Operation.* Washington, D.C.: The Association, 1967. 18 pp.

Common Sense Tips for Safe Sportcycling. Montecello, Calif.: Yamaha International Corp., 1967. 30 pp.

Dark, Harris E. The tricky two wheeler. *Family Safety* 25:10-12, Spring 1966.

———. Your youngster and the motorcycle. *Today's Health* 45:21-24, no. 5, May 1967.

———. Danger on two wheels. *Traffic Safety* 66:22-24, no. 4, Apr. 1966.

Davidson, Walter C. What the motorcycle industry is doing to promote safe operation. *Traffic Digest and Review* 18:14-16, Jan. 1967.

Driving in the Two-Wheel World. rev. ed. Gardena, Calif.: American Honda Motor Co., Inc., 1968. 191 pp.

Dunn, LeRoy W. *Motorcycle Research Project.* Oswego, N.Y.: State University College, 1966. 80 pp.

———. Teach them to ride. *Safety* 3:16-19, no. 2. March-Apr. 1967.

Handbook for Motorcycle Operators. Chicago: Montgomery Ward and Co., 1967. 23 pp.

Johnson, Duane R. What are you doing about motorcycle education? *Safety* 5:20-23, no. 3, May-June 1969.

Karping, William. *Intelligent Motorcycling.* Long Beach, Calif.: Parkhurst Publishing Co., 1966. 63 pp.

Motorcycle Driver Education Instructors Guide. Chicago: Montgomery Ward and Co., 1967. 7 pp.

National Safety Council. *Accident Facts.* Chicago: The Council. Annual.

———. *Motorcycles.* rev. ed. Chicago: The Council, 1968. 8 pp.

———. *Motorcycle Facts.* Chicago: The Council, 1970. 9 pp.

Northwestern University Traffic Institute. *Motorcycle Operation: A Manual for Riders.* Evanston, Ill.: The Institute, 1964. 18 pp.

Porter, Harry. Motorcycle laws are a must. *Traffic Safety* 66:12-13, no. 11, Nov. 1966.

Public Health Service, Injury Control Program. *Your Motorcycling Fun and Personal Protection.* Cincinnati, Ohio: United States Department of Health, Education, and Welfare, 1967. 6 pp.

———. *Motorcycles In the United States.* Cincinnati, Ohio: United States Department of Health, Education, and Welfare, 1967. 12 pp.

Timberlake, William E. The motorcycle rider in traffic. *Traffic Digest and Review* 18:3-7, Jan. 1967.

SAFETY IN DANCE

Dance | JACQUELINE A. CLIFFORD, P.E.D.

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All forms of dance are unique to their setting, performance, and structure. The mass, unified dances of folk and square are most frequently taught in the gymnasium with free open space; performed in organized floor patterns as circles, longways, and squares; and structured according to set rhythmic patterns of the music. Social dance is taught in a setting similar to folk and square dance, performed in less organized floor patterns, generally in couples, and structured in accordance with the rhythm and style of the music. Ballet and modern dance, both mass and individual, are generally taught in a studio with open area surrounded by mirrors and a ballet bar; performed in unlimited floor patterns; and structured in free form without music or in complex rhythmic form with music. Children's rhythms or creative activities are usually taught in the gymnasium, playroom or games room, classroom, and in some instances, the playground area. These activities are most often performed in free space patterns and structured by such directives as the story-line, music sounds, and simple rhythmic patterns.

As children grow and develop physiologically and socially they express feelings and thoughts through rhythmic activities. Ample space should be provided in formal and informal environments for these expressions to be made unhampered by hazardous conditions. Children should be encouraged to use both large and petite movements according to their wishes. The teacher has the responsibility of guiding these movement activities and of describing safe areas for the performance of these rhythmical expressions.

SETTING

Consideration should be given to the size of the facility in relation to the number of students and the extent of the movement activities. Dance classes are often large. The organization of the class should allow ample space for each student to perform the movement activity without the threat of bumping, hitting, or pushing another student. The teacher should be aware of the possibility of mishaps when planning the organizational patterns of the class and specific movement activities.

Note the quality of the floor space, whether it be wood or linoleum, tile or asphalt. The type of floor may be hazardous if the dance activities are not carefully selected. When the gymnasium floor is slippery, fast sliding movements in folk, square, and social dancing should be avoided. There are many dances that do not include these types of movements. The teacher should select the specific dances that can be safely performed on these floor conditions. If the texture of the floor is rough, with cracks and occasional splinters, then the students should wear ballet slippers or soft sandals for modern dance and ballet. Some studio floors are not constructed with flexible flooring. They may be a hardwood surface over concrete. Activities such as jumps and leaps should be limited, if taught in such a facility. The teacher should check the floor conditions to determine the type of dance and extent of movement that the students can safely execute.

Equipment, objects

Apparatus, equipment, and objects within the activity area should also concern the teacher. In situations where equipment for other class activities must be kept in the gymnasium, the teacher should see that these objects are placed as far as possible from the activity area and covered with protective materials when desirable. Caution should be used in this situation and the hazards should be pointed out to the students. In folk and square dance, designated areas for each square, circle, or line can be made so the possibility of the students running into the objects surrounding the activity space will be avoided. In modern dance and ballet, when students are doing locomotor movements across the floor, they can be instructed to finish the given movement pattern in ample time to stop before encountering the objects near the walls. In children's creative activities, the movement area can be easily restricted when imaginary walls enclose the activity space. It is interesting to note that the imaginary wall is often more readily recognized by children than by older students. Through imaginative teaching the surrounding objects can be easily eliminated from the child's creative space.

Class equipment such as record players, piano, and rhythm instruments should be located in convenient places and yet safely out of the activity area. All electric cords should be kept off the floor and confined to the storage cabinet or table where the record player is kept. The piano should be placed where the accompanist can see the activity but is out of the designated movement space. All rhythm instruments should be stored in enclosed cupboards or boxes and not left around as possible hazardous objects. After the children use the instruments they should be told where to put them in order to clear the activity area. The care and storage of equipment should be a prime concern of both the students and the teacher.

PERFORMANCE

Safety in performance is partially controlled by the teaching progression. In folk, square, and social dance the swing, slide, gallop, or run is presented so that when executed in the actual dance the skills are performed with control. There should be no swinging into other couples or sliding, galloping, or running into other dancers. If this occurs the teacher should point out the style of the particular dance.

Progression

In modern and ballet, the teaching progression is of utmost importance. Most of the techniques employed in the lesson are primarily warm-up activities. These should be taught in a progression where the demands of the body are on a degree scale, both of muscle activity and complexity. To avoid ankle and knee injuries, the feet and legs should be sufficiently "warm" before the students progress into leaps and jumps. There should be preparatory techniques or exercises of the torso and upper body before the students engage in turns and falls. The teacher's presentation of techniques or exercises preparatory to creative work is extremely important. The student should feel the body is ready for exploratory movement and be at ease to try new and different movements without the fear of a turned ankle or pulled muscle. These creative movements should not cause any injury to the students if the warm-up period has been wisely taught.

In creative activity with children, the period or length of time for the movement activity should be controlled by the teacher. The lesson is planned with concern for the type, quality, and extent of physical activity the participant can execute as well as the amount of rest period or quiet activity that should be included.

STRUCTURE

The structure of the dance activity is determined by the particular type of dance being taught. Students of all ages will be concerned with controlled movement in folk, square, and social that is governed by the rhythmic structure of the music. In modern and ballet when the rhythmic structure is free form there is more freedom in the movements; however, modern and ballet also can be complex in rhythmic structure, and then there are high demands on the student's control of movement. Children's creative dance is the freest form of structure and should be the least demanding on the control of the child.

In all instances where movement is to be executed according to a controlled rhythmic pattern, the students should be conscious of their individual movements as well as their movements in relationship to others. They should at all times work within the limits of their own physical abilities. Their movements should be executed on the basis of sound mechanical principles. The extent to which the teacher asks a student to execute movements controlled by rhythmic structure is determined by the individual's ability. Conscious observation and direction by the teacher can prevent stress and strain on the student.

RHYTHMIC EXPERIENCES FOR THE HANDICAPPED

Children who are confined to a wheelchair should not be denied the opportunity to participate in folk and square dancing. The wheelchairs may be maneuvered by children who can operate the wheelchairs in the execution of the dance patterns. The music should be slowed to a tempo which will provide ample time for the students to complete the dance patterns without undue pressure. If a square dance is being taught, the square should be sufficiently large to provide space for the children in the chairs to complete a do-si-do, a swing, or a grand right and left. The swing may be performed by the two students involved grasping the arms of the partners' chairs. The swing will in no way be hampered if the needed space for the movements is anticipated by the teacher.

The modern social dance patterns provide more individual freedom since ballroom dancing is no longer dependent on a closed dance position with a partner. This allows children who lack balance or the ability to perform exact movement patterns to enjoy the social advantages of ballroom dancing without feeling their inadequacies in executing set patterns.

CONCLUSION

Although rhythms and dance connotate great self-control and physical poise, the safe performance of dance is largely dependent upon one's physical readiness and the environmental limit ions. It is important that the body and mind become a unified whole as expression evolves through rhythmic movement. This cannot be accomplished when the body has been pulled, stretched, turned, or strained in any manner; the ideas cannot be translated into movements. Ideas and movements are sometimes unfortunately limited because a facility presents hazards which limit space and consequently the length and tempo of the movement patterns. In addition to space requirements, a desirable facility should be acoustically sound so that directions from a teacher may be accurately interpreted. Social and emotional attributes arising from rhythmic experiences will be enhanced if the facility is attractive.

Ventilation is an important aspect of an environment for rhythmic activity which may cause students to perspire profusely. Ventilation should be controlled through mechanical engineering or windows.

There should be a leveling off of physical activity planned within the scope of the lesson. This will gradually decrease the body heat and allow the body to return to normalcy. The warm-up and cool-off period in modern dance and ballet are especially important to the participant for safe physiological and kinesiological participation.

Rhythmic activities are no less hazardous than other activities in which movement and the possibility of colliding with another individual, group of individuals, or movable objects is possible. Speed or tempo and weight of the participant are factors which influence the safety hazards. The teacher must be aware of these factors and provide guidance to students which will assist them in analyzing hazards that their movements will precipitate.

Hopefully, dance will add to the precision and refinement of movement, body control, and poise. These objectives cannot be attained unless the student is aware of the safety hazards. Success will be a result of self-discipline which allows the student to eliminate hazardous situations for himself and to be sensitive to others involved in dance activities.

SAFETY IN CHILDREN'S MOVEMENT

Developmental and Play Activities | ANITA ALDRICH, Ed.D.

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Consider the factors that shape the personality of a child—his experiences, abilities, interests, attitudes, and other traits. Developmental and play experiences assist in stimulating the child to perceive and later to develop concepts. If he is to understand the world in which he lives he must explore actively his environment so he can organize and reorganize visual, auditory, and tactile impressions. These impressions must be channeled into safe practices.

Play is an environment in which a child becomes involved totally. He moves, he feels, he thinks, he acts, and he reacts. Because a child is receptive to play and possesses the potential for mastering neuromuscular skills early in his childhood, his elementary school years should be replete with movement experiences. The program in physical education should make children desire to develop physically, mentally, and socially to their maximum potential. It should also motivate them to evaluate themselves and others, make comparisons, and draw conclusions.

Safe ways of moving individually, with groups, and with objects are a part of good teaching. Proper footgear, such as rubber-soled or heeled shoes, may be instrumental in the prevention of accidents; socks without shoes increase hazards. Skill, knowledge, physical poise, experience, and consideration for others are the foundations of safe movement. As children learn to take turns, how to use apparatus and objects, and how to adjust to moving with each other, they learn courtesy and to avoid careless behavior, which may lead to accidents.

Movements involving self

A child who has only self, space, and floor on which to move is the master of his temporary environment. He may survey the area thoughtfully and silently; he may test his voice against the walls and rafters. Finally, he moves slowly, cautiously perhaps at first but he moves. He marches as a member of a military troop; he is his father at the head of a platoon. Suddenly, he mounts a white charger and gallops across space. From an upright galloping position he changes into a croaking frog that jumps from lily pad to lily pad. Now he emerges as Bluebeard the Pirate, adept at maintaining his balance as he runs the full length of his ship, leaps the gangplank, and soars through the air landing on the wharf. Finally, he revels in complete relaxation and sits and thinks of who and where he was as he moved through the space.

An individual may occupy a very limited area yet move with purpose and pleasure. He can twist and turn his body, lunge forward or diagonally, jump into the air, crouch, or stand tall.

He may crawl in various directions or roll from side to side, then onto his knees and arm. This rolling may be accompanied by kicking one leg or both legs, swinging his arms, or rolling his head. Of course, the area must be cleared of obstruction to avoid collisions.

Movements involving others

Children in the primary levels of school are adjusting to one another in classrooms, on the playground, and in the gymnasium. Some aggressiveness is necessary. Children should be given experiences in movements which involve moving with others, in opposition to others, and spacing themselves with others to avoid physical contact. Experiences should be pleasurable and foster cooperation, competition, self-discipline, and mental and physiological effort. Movements involving others may be an end in themselves or lead to structured games, rhythms, and self-testing activities. Dual movements range from quiet games such as jacks and hopscotch to more active games such as jump rope, tetherball, and stunts and tumbling.

As children move in opposition to one another, as in tug-of-war, or coordinate their efforts, as in leap frog, they become aware of each other's movements. This awareness and body control lead to safe play.

Movements involving objects

Objects, when combined with movement and used with understanding and purpose, become learning tools for a child. In the early stages of learning to manipulate objects, the objects dictate the movement. Lightweight objects such as utility balls should be used initially to prevent injury. The child is taught to keep his eyes on the object and to be ready to move in any direction to catch the object or to avoid being hit by it. As a child becomes increasingly skilled and develops concepts of the relationship between himself and objects, his movements control the objects.

Tetherball is a prime example of a game requiring complex movement reactions to an object. The ball, because of its shape and size, behaves in various ways when struck. In addition, the ball is attached to a rope which causes it to move in a circular pattern around the pole. As children strike the ball, its patterns of flight are changed. These variables require physical and mental alertness for effective and safe movement.

Movements involving combinations of self, others, and objects

Movements involving self, others, and objects should afford children challenges, pleasures, and problems for solving. Solutions to the problems should lie in skills both in breadth and depth, and insights into relationships of problems previously experienced. Relays may incorporate complex movements involving several people and objects of different sizes, weights, and shapes. Team effort is necessary for success. In a situation where five different objects are passed over the head, under the legs, and to the side in alternating patterns, team members must follow the rules and move efficiently and rapidly, staying in their own lines and maintaining a safe distance from the person in front of them.

Combining movements with others and with objects is not confined to games. Folk dancing may involve individuals manipulating objects separately or in unison, as well as moving in relation to other people, and learning spatial relationships. Children's ability to move the body to a rhythmical beat while simultaneously manipulating scarves, balloons, a parachute, or other objects increases the difficulty and adds pleasure to the dancing.

As motor skills improve and children become increasingly mature, they begin to enjoy the complexities of safe movement which increased numbers of people and objects afford.

Movement exploration

Movement exploration implies searching, examining, or discovering through the use of the body as it relates to time, space, motion, and objects. It begins in infancy when the child starts to kick, move his head, and discover parts of his body. As the child grows, he learns that the body has a system of levers and weights which can be handled to maintain balance, shift weight, and produce force.

By the time a child begins school, he is able to execute locomotor movements and many nonlocomotor (i.e. stationary) movements. As a child understands and applies the principles involved in locomotor and nonlocomotor movements, he learns ways in which he can communicate emotions, ideas, and feelings with his body. He may assume the role of a figure skater or a lonely man or pretend that he is walking in the mud or changing an automobile tire.

Rhythmic activity

Rhythm is the very essence of physiological existence. The heart beats rhythmically, the eyelids move rhythmically, and breathing is based upon rhythmical stimulation. Space, force, and time are common to both movement exploration and rhythm. Among the needs of children are those born of combining movement with rhythmic skills.

The element of space includes many movement possibilities. A child may walk forward, sideward, or in a circle; his movements may be big or little, narrow or wide. Time gives variations to a walk. A child may move at a slow, medium, or fast rate of speed. As he walks he may apply force in light, heavy, relaxed, or sudden steps, controlling his movements to avoid contact.

In introducing rhythmic activity to children, musical games can be incorporated. The games may involve responses to words or signals which require a change of direction or of body shape. Because children identify with their environment they like to be or do things with which they are familiar, such as being an airplane or mowing the lawn.

Most children can execute fundamental steps (i.e., walk, run, hop, and jump) before they begin school. These steps can be combined into a pattern. For example, a walk (step) and a hop executed on first one foot then the other become a skip; the gallop is a combination of a walk and a run using a step-together pattern. A sideward gallop may be interpreted as a slide to children. Most pattern dances such as a polka, schottische, or mazurka are built on a skip, gallop, or slide. These and other traditional dance steps, such as the two-step and waltz, are combinations of basic locomotor movements.

Self-testing activities

Self-testing experiences are those in which the emphasis is on individual improvement and accomplishment. Play activities of a self-testing nature appeal to a child because he receives satisfaction from relying upon himself to test his control over his environment and learns to recognize his strengths and weaknesses.

Many schools have self-testing programs in which test scores are compared with national, state, or local norms; the value of comparison lies in individual appraisal. This program should be designed so that increasingly difficult problems in movement are provided for the child as soon as he accomplishes a less complex one.

Self-testing activities increase the child's awareness of his need for greater body control and improvement of his balance, timing, and coordination. He learns how to fall and land safely from a jump. Not only are personal potential and achievement recognized through these activities, but a child also learns appreciation for others' abilities. In tumbling he learns to assist others by "spotting" without injury to himself.

Games

Games provide recreation as well as educational values for children. They enjoy associating with other children, meeting the goal of the game, and coping with the complexity of the rules.

In selecting a game, it is important to determine whether it can be adapted to the space safely, whether it interests the children, provides vigorous activity and emotional release, offers experiences in social adjustment, requires strategy, and utilizes skill appropriate to their stage of motor development. Incorporated within the rules of the games children play are such locomotor movements as chasing, tagging, throwing, batting, and kicking. It has been said that games are one of the richest environments for fostering aggressiveness. Children should be taught where to tag another and the force to be applied to prevent injury.

Very young children live in an "I" centered environment. When they enter school, it is necessary for them to become accustomed to a group situation so they may become a member of a "we" environment. Introductory games of circle and line formations provide an excellent setting for this transition. Gradually, children progress from solo and parallel playing to becoming a member of a group and feeling an allegiance to a team. Team games with a minimum of rules lead quickly to a spirit of cooperation. As games become more highly organized the need for discussion and strategy increases. Relays foster the team idea. Through them, a child can be taught that he is racing for the group or team to which he belongs while adhering to the rules, thus preventing injury and accidents.

Boys and girls at the intermediate level enjoy learning and participating in advanced team games. The games should be geared to require motor coordination, social intelligence, and self-discipline appropriate to their maturity. It is a fallacy for adults to insist upon regulation equipment, regulation playing courts or diamonds, and adult competitive standards. Not only could these practices be injurious to the safety of the immature child, but the majority of 9- to 11-year-olds prefer equipment and rules which will allow them to use those skills and knowledge which their stage of development permits.

This phase of physical education provides an avenue for excellence in performance due to a continued refinement of skills as the child works toward mastering progressively complex movement patterns.

Activities involving playground apparatus

No longer are haylofts available for children to enjoy. Trees in parks cannot be nurtured nor will they grow if children, as they climb them, break branches or skin the bark. Playground apparatus furnishes children an opportunity to reach, bend, pull, swing, and climb in much the same way that haylofts and trees once did.

These activities develop the upper portion of the body, providing the child furnishes the movement. Apparatus which is developmental in nature includes horizontal bars and ladders, jungle gyms, and climbers. Once the equipment has been safely installed and is periodically tested, the burden of safety should be placed on the child when he is using the equipment; safety rules should be reduced to a minimum. The hand grip, the correct dismount, and the number of children using a single piece of apparatus should suffice for safe equipment use.

The safest hand grip is placing the fingers over the rungs of a piece of apparatus with the thumb under the rung and locked over the fingers. As the child walks the horizontal ladder with his hands, this grasp is a natural one as he reaches for the next rung. This grip also applies to climbing ropes or poles.

The important aspect of dismounting from apparatus is the manner in which it is executed rather than the surface to which one dismounts. If a child drops carelessly because he thinks the surface will compensate for the poor drop, injury may result. Sand, tan bark, or turf worn by use can cause a child to land off-balance when he dismounts. Too often a child uses a rubberized surface or mat under apparatus as a landing crutch. A correct dismount precludes the child's weight from going backward and assures that his feet will land solidly in a parallel position. His hands should be in front of him in case he needs to touch them to the surface for balance.

A starting place painted on the apparatus or directional arrows on the surface under the apparatus will aid to equalize equipment use as well as minimize the incidents of children approaching the apparatus in opposite directions.

The following diagram (Figure 1) suggests a plan for locating apparatus and indicates the line of direction to follow in moving from one piece of apparatus to the next. Note that the climbing apparatus is interspersed with apparatus from which a child can hang.

Summary

The safety factors involved must be considered in relationship to all movement. Children should develop attitudes that foster respect and consideration for others as they move and practice habits that will eliminate safety hazards for themselves and others. They must also exercise self-discipline and learn how to anticipate what will happen in various situations brought about by movement. Strength, coordination, agility, balance, and flexibility are essential if one is to move safely.

Living is an adventure, an exploration. Modern living presents increased hazards because of the movement of many people and objects of varying sizes, shapes, and speeds. If man is to move safely with the masses, he must first learn in his youth to move safely as an individual and then with groups in controlled environments.

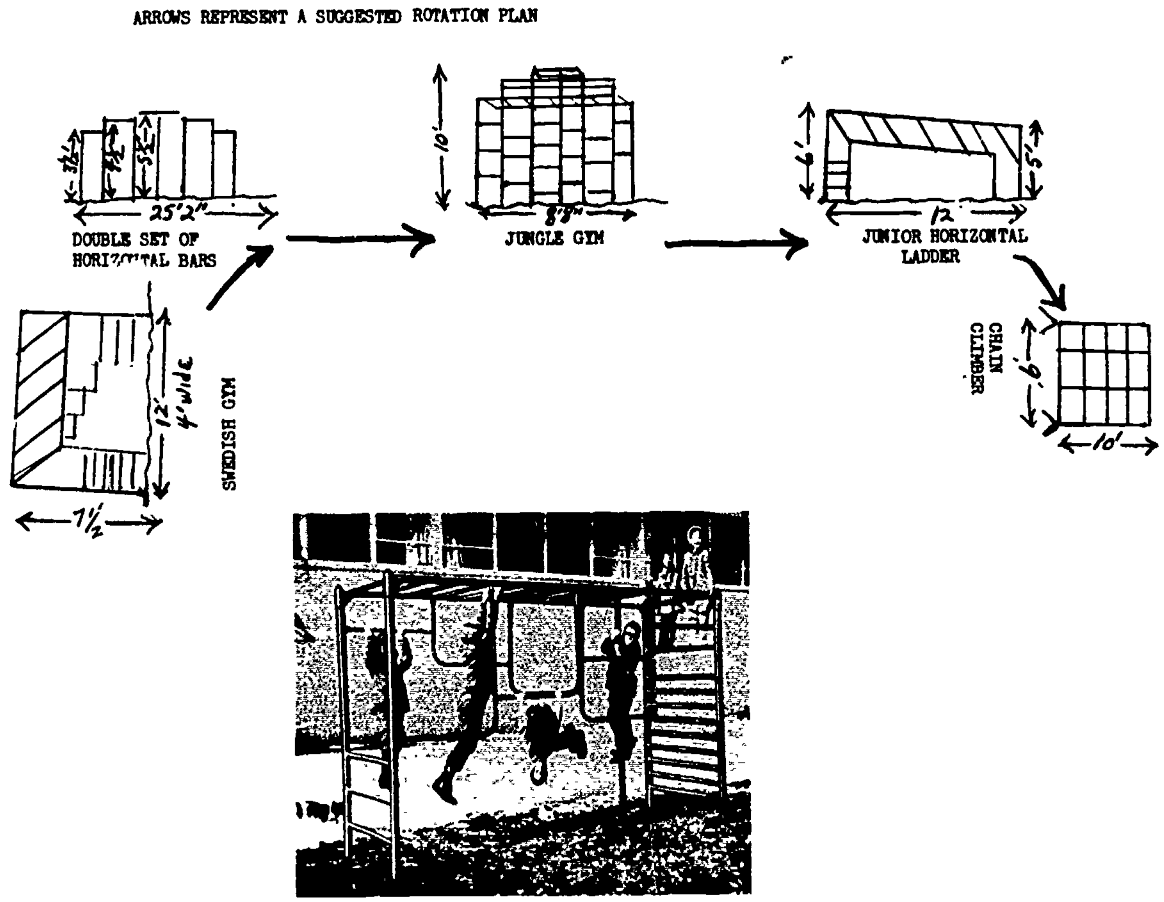

Figure 1. At top is a plan for locating playground apparatus and at bottom a photograph of the Swedish Gym.

References

Axline, Virginia M. *Dibs In Search of Self*. Boston: Houghton Mifflin Co., 1967.

Baley, James A. *An Illustrated Guide to Tumbling*. Boston: Allyn and Bacon, Inc., 1968.

Broer, Marion R. *Efficiency of Human Movement*. Philadelphia: W. B. Saunders Co., 1960. 351 pp.

Clarke, Harrison H. and Clarke, David H. *Developmental and Adapted Physical Education*. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1963. 364 pp.

Fabricius, Helen. *Physical Education for the Classroom Teacher*. Dubuque, Iowa: William C. Brown Co., 1965. 349 pp.

Hackett, Layne C. and Jenson, Robert G. *A Guide to Movement Exploration*. Palo Alto, Calif.: Peek Publications, 1967. 73 pp.

Jones, Edwina; Morgan, Edna; and Stevens, Gladys. *Methods and Materials in Elementary Physical Education*. Yonkers-on-Hudson, N.Y.: World Book Co., 1957. 432 pp.

Mussen, Paul H. *The Psychological Development of the Child*. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1964. 109 pp.

O'Quinn, Garland, Jr. *Gymnastics for Elementary School Children*. Dubuque, Iowa: William C. Brown Co., Inc., 1967. 122 pp.

Russell, James E. *Change and Challenge in American Education*. Boston: Houghton Mifflin Co., 1965. 115 pp.

Sartain, Arron O.; North, Alvin J.; Strange, Jack R.; and Chapman, Harold M. *Psychology Understanding Human Behavior*. New York: McGraw-Hill Book Co., Inc., 1958. 444 pp.

Shurr, Evelyn L. *Movement Experiences for Children*. New York: Appleton-Century-Crofts, 1967. 569 pp.

Vannier, Maryhelen and Foster, Mildred. *Teaching Physical Education in Elementary Schools*. 4th ed. Philadelphia: W. B. Saunders Co., 1968. 400 pp.

APPENDIX A

SUGGESTED COURSE OUTLINE FOR A COLLEGE COURSE IN SPORTS SAFETY

Course title and description

Sports Safety in Modern Society. Philosophy of sports safety: human and environmental factors and their interrelationships in sports injury and its control; risk-taking and decision solution strategies; application of accident prevention and injury control to selected sports; contributions of sports medicine to safety. (30-45 hours; 2-3 credits; U. or G.)

Course objectives

To develop a philosophy of sports safety
To analyze the human factors leading to sports safety
To identify the environmental factors in sports safety
To study measures for the control of hazards in sports
To determine risk-taking and decision-making procedures for control of sports injury
To study specific controls designed to lessen accident experience in selected sports and athletic activities
To contribute a fuller understanding of leadership responsibilities of professionals in sports and athletics to achieve greater safety in sports

Course content

I. THE INJURY PROBLEM IN SPORTS
- The problem defined
  - Accidents in society
  - Injury control
  - Risk-acceptance
  - Accident prevention
  - Inherent risks in sports activities
- Data of public involvement and accidents in various activities
  - Organized programs
  - Unorganized recreational sports
  - Preschool physical activities
  - School and college accidents and injuries
  - Need for data and accident reporting

II. A PHILOSOPHY OF ACCIDENT AND INJURY CONTROL
- Factors of causation
- Principles of accident prevention and hazards control
- Individual responsibilities for safety in sports
- Community relationships and involvement

III. ADMINISTRATION AND SUPERVISION OF SPORTS PROGRAMS
- Development of policies for safety achievement
- External controls
  - Rules and regulations of leagues and conferences
  - State laws and liability
  - Insurance and athletic benefit plans
  - Officiating controls
- Internal controls
  - School administrative principles and policies
    - Superintendent-principal
    - Department heads; staff
    - Faculty: instructors and coaches
    - Students
  - Physical and health examinations
  - Limitations of parents' consent
    - Liability waivers
    - Travel permit forms
  - Homogeneous grouping for safe competition
    - Age, height, weight
    - Competency
  - Facilities, leadership, and equipment controls
    - In school: boys-girls
    - Out of school: adults

- Transportation safety — players, spectators
- Environmental safety for spectators
- Fire prevention and fire protection for sports activities
- Conduct of sports for safety
  - Even and fair competition
  - Limits on control of contests
  - Limits on practice sessions
  - Preseason practice policies

Leadership controls
- Teaching techniques
  - School policies for teacher responsibilities
  - Progression in teaching—safety features
  - Motivational procedures
  - Evaluation of the teaching process and safety

Facilities, equipment, and supplies
- Planning of facilities
  - Program requirements
  - Equipment requirements
  - Architectural technology for safety controls
- Chief safety aspects of facilities, equipment, and supplies
  - Game play areas, surface, lighting, ventilation
  - Protective enclosure
  - Placement of equipment
  - Safety standards for purchase of facilities, equipment, and supplies
  - Locker and shower room layout
  - Storage areas, security against unauthorized use
  - Color coding of devices, areas, equipment for safety
- Supervision on purchases for safety of materials
  - Age, sex, participants, type of activities
  - Educating the participant in safety procedures
  - Periodic evaluation of facilities and equipment

IV. FIRST AID AND EMERGENCY PROCEDURES

- Definition and significance of first aid
  - Role in accident prevention
  - Relationships — first aider with medical advisor
  - Implications from the nature of sports
- Master plan for first aid and emergency procedures
  - Written policies
  - Procedures
  - First aid facilities and supplies
- Competencies of leadership in first aid

V. ACCIDENT INVESTIGATION AND REPORTING

- Purpose and procedures
  - Report forms
- Investigation — remedial action
- Reporting
  - Cooperation with state and national agencies
  - Monthly-annual summaries of data

VI. SPORTS ACTIVITIES

- Development and play activities
- Team sports
  - Baseball and softball
  - Basketball
  - Field hockey
  - Football: touch, flag
  - Ice hockey
  - Lacrosse
  - Soccer
  - Volleyball
- Individual sports
  - Archery
  - Bowling
  - Equitation
  - Golf
  - Gymnastics
  - Marksmanship
  - Track and field
  - Weight lifting

Dual sports
- Fencing
- Handball
- Judo
- Racquet and paddle sports
- Wrestling

Aquatic activities
- Swimming, diving, water survival and rescue
- Recreational swimming
- Fancy diving
- Water polo

Open water aquatic sports
- Small craft
- Water skiing
- Skin, scuba diving
- Surfing

Winter sports
- Skating
- Skiing
- Tobogganing and sledding
- Iceboating
- Ice fishing
- Snowmobiling
- Snowshoeing

Outing activities
- Fishing: stream, surf, boat
- Camping
- Hunting
- Hiking and mountaineering
- Bicycling
- Recreational motorcycling

Dance

VII. EVALUATION AND SUMMARY

- Objectives achieved
- New problems in sports safety
- The future of sports safety

TEXT:

Sports Safety: Accident Prevention and Injury Control in Physical Education, Athletics, and Recreation. Charles Peter Yost, Editor. American Association for Health, Physical Education, and Recreation and U.S. Public Health Service. Washington, D.C.: The Association, 1970.

References

American Association for Health, Physical Education, and Recreation. *Annual Safety Education Review.* Washington, D.C.: The Association. Annual.

———. *School Safety Policies with Emphasis on Physical Education, Athletics, and Recreation.* Washington, D.C.: The Association, 1968. 32 pp.

American Medical Association. *Standard Nomenclature of Athletic Injuries.* Chicago: AMA Subcommittee on Classification of Sports Injuries, Committee on the Medical Aspects of Sports, 1966. 157 pp.

American Public Health Association. *The Role of Physicians and Public Health Workers.* Edited by Maxwell N. Halsey. New York: McGraw-Hill Book Co., 1961. 400 pp.

Florio, A. E. and Stafford, G. T. *Safety Education.* 3d ed. New York: McGraw-Hill Book Co., 1969. 459 pp.

Grieve, Andrew. *The Legal Aspects of Athletics.* New York: A. S. Barnes & Co., Inc., 1969. 183 pp.

Haddon, William, Jr.; Suchman, Edward A.; and Klein, David. *Accident Research—Methods and Approaches.* New York: Harper & Row, Publishers, 1964. 752 pp.

Liebee, Howard. *Tort Liability for Injuries to Pupils.* Ann Arbor: Campus Publishers, 1965.

National Association of College Directors of Athletics and Division of Men's Athletics, American Association for Health, Physical Education and Recreation. *Administration of Athletics in Colleges and Universities.* Edited by Edward S. Steitz. Washington, D.C.: AAHPER, 1971.

National Commission on Safety Education. *Who Is Liable for Pupil Injuries?* Washington, D.C.: National Education Association, 1963.

National Safety Council. *Accident Facts.* Chicago: The Council. Annual.

Seaton, Don Cash; Stack, Herbert J.; and Loft, Bernard I. *Administration and Supervision of Safety Education.* New York: The Macmillan Co., 1969. 368 pp.

Stack, Herbert J. and Elkow, J. Duke. *Education for Safe Living.* 4th ed. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966. 374 pp.

Strasser, Marland K.; Aaron, James E.; Bohn, Ralph C.; and Eales, John R. *Fundamentals of Safety Education.* New York: The Macmillan Co., 1964. 453 pp.

Thorndike, Augustus. *Athletic Injuries.* Philadelphia: Lea & Febiger, 1962. 259 pp.

APPENDIX B

The following forms in Appendix B are reprinted by permission of the Joint Commission on Competitive Safeguards and Medical Aspects of Sports, which is composed of the American College Health Association, National Athletic Trainers Assciation, National Collegiate Athletic Association, National Federation State High School Athletic Association, and National Junior College Athletic Association.

JOINT COMMISSION ON COMPETITIVE SAFEGUARDS AND MEDICAL ASPECTS OF SPORTS

The information on this form will be used to make football a safer sport to play. Answer questions by placing an X in the brackets. Please answer carefully, since the study can be no better than the information you give us. When completed, return this form to your trainer. Thank you for your cooperation.

Pages 3 and 4 are to be filled in by trainer; remaining pages are to be filled in by players TRAINER.

PLAYER'S NAME ____________

PLAYER PROFILE DESCRIPTION

What is your social security number? ___ ___ ___ - ___ ___ - ___ ___ ___ ___ 14-22

What is your present age as of your last birthday?

01 ( ) Less than 14 05 ( ) 17 years 09 ( ) 21 years
02 ( ) 14 years 06 ( ) 18 years 10 ( ) 22 years 23-24
03 ( ) 15 years 07 ( ) 19 years 11 ( ) 23 years
04 ( ) 16 years 08 ( ) 20 years 12 ( ) 24 years or older

Have you had a birthday in the past six months?

1 ( ) Yes 2 ( ) No 25

What is your racial heritage?

1 ( ) Black 2 ( ) White 3 ( ) Other 26

Do you play for?

1 ( ) a High School 2 ( ) a Community or Junior College 3 ( ) a College or University 27

What is your year of eligibility?

1 ( ) First (Freshman) 3 ( ) Junior
2 ( ) Second (Sophomore) 4 ( ) Senior 28

Are you?

1 ( ) Right handed 2 ( ) Left handed 3 ( ) Ambidextrous 29

Do you wear a dental protector or mouthpiece?

1 ( ) Yes 2 ( ) No 30

What type of football shoes do you wear?

1 ( ) Lowcut 3 ( ) Hightop 4 ( ) Soccer 31
2 ( ) Medium (three-quarter)

Do you wrap or tape your ankles for routine prevention of injury?

1 ( ) Yes 2 ( ) No 32

If yes, what do you use?

1 ( ) Tape 3 ( ) Elastic wrap
2 ( ) Wrap 4 ( ) Other 33

How much do you weigh?

01 ( ) Less than 100 pounds	07 ( ) 150-159 pounds	13 ( ) 210-219 pounds	
02 ( ) 100-109 pounds	08 ( ) 160-169 pounds	14 ( ) 220-229 pounds	
03 ( ) 110-119 pounds	09 ( ) 170-179 pounds	15 ( ) 230-239 pounds	34-35
04 ( ) 120-129 pounds	10 ( ) 180-189 pounds	16 ( ) 240-249 pounds	
05 ( ) 130-139 pounds	11 ( ) 190-199 pounds	17 ( ) 250-259 pounds	
06 ( ) 140-149 pounds	12 ( ) 200-209 pounds	18 ( ) 260 pounds or more	

How tall are you?

01 ( ) Under 5 feet, 3 inches	08 ( ) 5 feet, 9inches	15 ( ) 6 feet, 4 inches	
02 ( ) 5 feet, 3 inches	09 ( ) 5 feet, 10 inches	16 ( ) 6 feet, 5 inches	
03 ( ) 5 feet, 4 inches	10 ( ) 5 feet, 11 inches	17 ( ) 6 feet, 6 inches	36-37
04 ( ) 5 feet, 5 inches	11 ( ) 6 feet	18 ( ) 6 feet, 7 inches	
05 ( ) 5 feet, 6 inches	12 ( ) 6 feet, 1 inch	19 ( ) 6 feet, 8 inches	
06 ( ) 5 feet, 7 inches	13 ( ) 6 feet, 2 inches	20 ( ) 6 feet, 9 inches and above	
07 ( ) 5 feet, 8 inches	14 ( ) 6 feet, 3 inches		

Do you routinely wear any bracing or tape on a knee because of previous injury?

1 ( ) Yes, on both knees	3 ( ) Yes, on right knee	
2 ( ) Yes, on left knee	4 ( ) No	38

If yes, what type?

1 ( ) Tape	2 ( ) Brace	3 ( ) Other	39

What is your normal offensive playing position? If you play more than one, indicate the one played most frequently.

01 ( ) Split End	05 ( ) Center	09 ( ) Tailback	
02 ( ) Tight End	06 ( ) Quarterback	10 ( ) Flanker	40-41
03 ( ) Tackle	07 ( ) Fullback	11 ( ) Halfback	
04 ( ) Guard	08 ( ) Wingback	12 ( ) Kicker or Punter	
		13 ( ) Don't play offense	

What is your normal defensive playing position? If you play more than one, indicate the one played most frequently.

1 ( ) End	4 ( ) Roverguard	7 ( ) Halfback or Cornerback	
2 ( ) Tackle	5 ( ) Middle guard	8 ( ) Safety	42
3 ( ) Guard	6 ( ) Linebacker	9 ( ) Don't play defense	

When you received your helmet, who fitted it?

1 ( ) Coach	4 ( ) Student Manager	7 ( ) Yourself	
2 ( ) Trainer	5 ( ) Company Representative		43
3 ( ) Equipment Manager	6 ( ) Team Physician		

Did you have a physical examination for football by a doctor within 6 months of the regular football season?

1 ( ) Yes	2 ( ) No	44

PLEASE RETURN THIS FORM TO YOUR TRAINER

PAGE 2

PAGES 3 and 4 ARE TO BE COMPLETED BY TRAINER.

Year 02 1-2 [ ] 3-4 [ ] 5-7

Conference Code School Code

What is the make of this player's helmet?

1 ( ) Bell 5 ( ) Riddel
2 ( ) Gladiator 6 ( ) Spalding
3 ( ) McGregor 7 ( ) Wilson — 8
4 ( ) Rawlings 8 ( ) Other ____________
write in brand name

How many years has this helmet been used?

1 ( ) New (never used) 5 ( ) 3 years
2 ( ) Less than 1 year 6 ( ) 4 or more years — 9
3 ( ) 1 year 7 ( ) Unknown or not sure
4 ( ) 2 years

Has this helmet ever been reconditioned?
1 ( ) Yes 2 ( ) No 3 ( ) Unknown — 10

If yes, how many years ago?

1 ( ) 1 year 3 ( ) 3 years
2 ( ) 2 years 4 ( ) 4 years or more — 11

If yes, who did the reconditioning?

____
write in company's name

What type of face gear does this helmet have?

1 ( ) None 4 ( ) Half cage
2 ( ) One bar 5 ( ) Full cage — 12
3 ( ) Two bars

Does this player's helmet have?

1 ( ) Internal padding 3 ( ) Both internal padding and
2 ( ) Internal suspension internal suspension — 13

THIS PAGE IS TO BE COMPLETED BY TRAINER AT END OF SEASON

In how many games did this player participate? ______ number of games 45-46

How many minutes did this player play in actual games? 47-48

01 ( ) Less than 60 minutes
02 ( ) 60-120 minutes
03 ( ) 121-180 minutes
04 ( ) 181-240 minutes
05 ( ) 241-300 minutes
06 ( ) 301-360 minutes
07 ( ) 361-420 minutes
08 ( ) 421-480 minutes
09 ( ) 481-540 minutes
10 ( ) 541-600 minutes
11 ( ) 601-660 minutes
12 ( ) 661-720 minutes

How many injury forms were completed for this player? 49

1 ( ) None (No injury for this player)
2 ( ) One injury form
3 ( ) Two injury forms
4 ( ) Three or more injury forms

If this player was injured, will long term disability result? 50

1 ( ) Yes
2 ( ) No

If this player was injured, was surgical correction required, or will it be required? 51

1 ( ) Yes
2 ( ) No

THANK YOU FOR YOUR COOPERATION

JOINT COMMISSION COMPETITIVE SAFEGUARDS &
MEDICAL ASPECTS OF SPORTS

NATIONAL TACKLE FOOTBALL INJURY REPORT

Instructions:
A. Please answer all pertinent questions.
B. This form should be completed within 48 hours after the injury has occurred.

****

Injured player's social security number ___ ___ ___ - ___ ___ - ___ ___ ___ ___. 1-9

Injury number of this player during this season ?

1 ( ) First 2 ( ) Second 3 ( ) Third 4 ( ) Fourth or more 10

INJURY DESCRIPTION

If injury is multiple injury type or more than one body part is involved, do not check nature of injury or body part involved but please describe the injury on the following lines.

____

______________________________ 11-14

____

Nature of Injury (check only one)

01 ( ) Contusion
02 ( ) Minor concussion (stunned, dazed)
03 ( ) Moderate concussion (no symptoms after 24 hours)
04 ( ) Severe concussion (symptoms persist over 24 hours)
05 ( ) Dental injury
06 ( ) Dislocation
07 ( ) Fracture
08 ( ) Puncture
09 ( ) 1st degree sprain (ligament)
10 ( ) 2nd degree sprain (ligament)
11 ( ) 3rd degree sprain (complete rupture of ligament)
12 ( ) 1st degree strain (muscle)
13 ( ) 2nd degree strain (muscle)
14 ( ) 3rd degree strain (complete rupture of muscle) 15-16
15 ( ) Heat exhaustion or sun stroke
16 ( ) Frostbite
17 ( ) Other
18 ( ) Unknown

Body Part Involved (check one only)

Head and Face

01 ( ) Jaw
02 ( ) Face
03 ( ) Nose
04 ( ) Scalp
05 ( ) Skull
06 ( ) Forehead
07 ( ) Eye
08 ( ) Eyelid or eyebrow
09 ( ) Lip
10 ( ) Tongue
11 ( ) Teeth
12 ( ) Inside of cheek
13 ( ) Ear
14 ( ) Head CNS

Neck

21 ( ) Vertebrae 22 ( ) Soft tissue 23 ( ) Nerve 24 ( ) Spinal cord

Chest

31 ( ) Ribs 32 ( ) Lung 33 ( ) Heart 34 ( ) Sternum 35 ( ) Other chest

17–18

Abdomen

41 ( ) Spleen 42 ( ) Liver 43 ( ) Other abdomen

GU Tract

51 ( ) Kidney 52 ( ) Bladder 53 ( ) Testes 54 ( ) Penis

Musculo-Skeletal

61 ( ) Vertebrae
62 ( ) Acromio-clavicular
63 ( ) Sterno-clavicular
64 ( ) Shoulder
65 ( ) Clavicle
66 ( ) Scapula
67 ( ) Upper arm
68 ( ) Elbow
69 ( ) Forearm
70 ( ) Wrist
71 ( ) Hand
72 ( ) Finger
73 ( ) Pelvis
74 ( ) Iliac Crest
75 ( ) Hamstring
76 ( ) Hip
77 ( ) Groin
78 ( ) Thigh
79 ( ) Knee
80 ( ) Lower leg
81 ( ) Ankle
82 ( ) Foot
83 ( ) Toe
84 ( ) Other M-S

Body Side of Injury

1 ( ) Right 2 ( ) Left 3 ( ) Not applicable 19

Severity of Injury

1 ( ) Fatal 2 ( ) Hospitalized more than 24 hours 3 ( ) Hospitalized less than 24 hours
4 ( ) Injury with time lost from game or practice 5 ( ) Injury without time lost from participation 20

Was this a Reinjury ?

1 ( ) Yes 2 ( ) No 21

If yes, how did the original injury occur ?

1 ( ) Athletic activity 2 ( ) Nonathletic activity 22

Type of activity at time of injury

1 ( ) Game
2 ( ) Live scrimmage
3 ( ) Dummy scrimmage
4 ( ) Exercise (calisthenics, isometrics, weights)
5 ( ) Group drills
6 ( ) Individual drills
7 ( ) Other

23

If a game or scrimmage, indicate type of play

1 ( ) Pass
2 ( ) Run
3 ( ) Punt
4 ( ) Kick off
5 ( ) Field goal
6 ( ) PAT
7 ( ) Fumble
8 ( ) Other

24

If injury occurred during a scheduled game, did a rule infraction contribute to the injury?

1 ( ) Yes 2 ( ) No

25

If yes, was a penalty called ?

1 ( ) Yes 2 ( ) No

26

If injured player was on offense, was he ?

01 ( ) Kicking
02 ( ) Being tackled
03 ( ) Shoulder blocking
04 ( ) Crack-back blocking
05 ( ) Butt blocking
06 ( ) Other blocking
07 ( ) Piled on
08 ( ) Stepped on
09 ( ) Running with no contact
10 ( ) Running into a fixed object
11 ( ) Not applicable

27-28

If injured player was on defense, was he ?

01 ( ) Blocking kick
02 ( ) Tackling
03 ( ) Shoulder blocked
04 ( ) Crack-back blocked
05 ( ) Butt blocked
06 ( ) Other blocked
07 ( ) Piled on
08 ( ) Stepped on
09 ( ) Running with no contact
10 ( ) Running into a fixed object
11 ( ) Not applicable

29-30

Field surface

1 ( ) Grass
2 ( ) Dirt
3 ( ) Astroturf
4 ( ) Tartan turf
5 ( ) Poly turf
6 ( ) Mud

31

Time of injury

1 ( ) Spring practice
2 ( ) Practice prior to first game
3 ( ) During scheduled game
4 ( ) Practice after first game

32

If injury occurred prior to first game, indicate practice session

01 ( ) 1st	07 ( ) 7th	13 ( ) 13th	19 ( ) 19th	25 ( ) 25th	
02 ( ) 2nd	08 ( ) 8th	14 ( ) 14th	20 ( ) 20th	26 ( ) 26th	
03 ( ) 3rd	09 ( ) 9th	15 ( ) 15th	21 ( ) 21st	27 ( ) 27th	33-34
04 ( ) 4th	10 ( ) 10th	16 ( ) 16th	22 ( ) 22nd	28 ( ) 28th	
05 ( ) 5th	11 ( ) 11th	17 ( ) 17th	23 ( ) 23rd	29 ( ) 29th	
06 ( ) 6th	12 ( ) 12th	18 ( ) 18th	24 ( ) 24th	30 ( ) 30th	

If injury occurred after first game, please indicate week after first game.

01 ( ) 1st	05 ( ) 5th	09 ( ) 9th	13 ( ) 13th	
02 ( ) 2nd	06 ( ) 6th	10 ( ) 10th	14 ( ) 14th	35-36
03 ( ) 3rd	07 ( ) 7th	11 ( ) 11th	15 ( ) 15th	
04 ( ) 4th	08 ( ) 8th	12 ( ) 12th	16 ( ) 16th or more	

Quarter of injury ?

1 ( ) 1st 2 ( ) 2nd 3 ( ) 3rd 4 ( ) 4th 5 ( ) Not applicable 37

What type of cleats were on this player's football shoes at time of injury ?

1 ( ) Conical cleats	4 ( ) Ripple cleats	
2 ( ) Soccer cleats	5 ( ) Other type of cleats	38
3 ( ) Multiple cleats	6 ( ) No cleats	

What type of heel was on this player's football shoes at time of injury ?

1 ( ) Ring	4 ( ) Cleat
2 ( ) Bar	5 ( ) Other
3 ( ) Shoe	

Was this player's helmet at time of injury the same as orginally described on the PLAYER PROFILE DESCRIPTION at the beginning of the year ?

1 ( ) Yes 2 ( ) No

If no, please describe the difference in the helmet.

____

____

____

Year is 02 39