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Protective Eyewear for Young Athletes
Committee on Sports Medicine and Fitness
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AMERICAN ACADEMY OF PEDIATRICS

Committee on Sports Medicine and Fitness

AMERICAN ACADEMY OF OPHTHALMOLOGY

Eye Health and Public Information Task Force

POLICY STATEMENT

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of All Children

Protective Eyewear for Young Athletes

ABSTRACT. The American Academy of Pediatrics and American Academy of Ophthalmology strongly recommend protective eyewear for all participants in sports in which there is risk of eye injury. Protective eyewear should be mandatory for athletes who are functionally 1-eyed and for athletes whose ophthalmologists recommend eye protection after eye surgery or trauma.

ABBREVIATIONS. ASTM, American Society for Testing and Materials; ANSI, American National Standards Institute; CSA, Canadian Standards Association; HECC, Hockey Equipment Certification Council.

BACKGROUND

More than 42 000 sports and recreation-related eye injuries were reported in 2000.¹ Seventy-two percent of the injuries occurred in individuals younger than 25 years, 43% occurred in individuals younger than 15 years, and 8% occurred in children younger than 5 years.¹ Children and adolescents may be particularly susceptible to injuries because of their aggressive play, athletic maturity,²⁻⁴ and poor supervision in some recreational situations.

The sports highlighted in this statement were chosen on the basis of their popularity and/or the high incidence of eye injuries in that sport. Participation rates and information on the severity of the injuries are unavailable; therefore, the relative risk of significant injuries cannot be determined for various sports. Baseball and basketball are associated with the most eye injuries in athletes 5 to 24 years old.¹

The eye-injury risk of a sport is proportional to the chance of the eye being impacted with sufficient energy to cause injury. The risk is not correlated with the classification of sports into collision, contact, and noncontact categories. Instead, the risk of eye injury to the unprotected player is roughly categorized as high risk, moderate risk, low risk, and eye safe. The sports included in each of these categories are listed in Table 1.

EVALUATION

All athletes and their parents should be made aware of the risks associated with participation in

sports and the availability of a variety of certified sports eye protectors. Although eye protectors cannot eliminate the risk of injury, appropriate eye protectors have been found to reduce the risk of significant eye injury by at least 90% when fitted properly.⁴⁻⁶ It would be ideal if all children and adolescents wore appropriate eye protection for all eye-risk sports and recreational activities.

Physicians should strongly recommend that athletes who are functionally 1-eyed wear appropriate eye protection during all sports, recreational, and work-related activities. Functionally 1-eyed athletes are those who have a best corrected visual acuity of worse than 20/40 in the poorer-seeing eye.^{1,4,7} If the better eye is injured, functionally 1-eyed athletes may be handicapped severely and unable to obtain a driver's license in many states.⁸

Athletes who have had eye surgery or trauma to the eye may have weakened eye tissue that is more susceptible to injury.⁹ These athletes may need additional eye protection or may need to be restricted from certain sports; they should be evaluated and counseled by an ophthalmologist before sports participation.

PROTECTIVE EYEWEAR OPTIONS

Eye protection and different brands of sports goggles vary significantly in both the way they fit and their capacity to protect the eye from injury. An experienced ophthalmologist, optometrist, optician, physician, or athletic trainer can help an athlete select appropriate protective gear that fits well and provides the maximum amount of protection. Sports programs should assist indigent athletes in evaluating and obtaining protective eyewear.

There are 4 basic types of eyewear. The 2 types that are satisfactory for eye-injury risk sports include:

1. Safety sports eyewear that conforms to the requirements of the American Society for Testing and Materials (ASTM) standard F803 for selected sports (racket sports, baseball fielders, basketball, women's lacrosse, and field hockey).¹⁰
2. Sports eyewear that is attached to a helmet or for sports in which ASTM standard F803 eyewear is inadequate. Those for which there are standard

TABLE 1. Categories of Sports Eye-Injury Risk to the Unprotected Player*

High Risk	Moderate Risk	Low Risk	Eye Safe
Small, fast projectiles Air rifle BB gun Paintball	Tennis Badminton Soccer Volleyball	Swimming Diving Skiing (snow and water) Noncontact martial arts	Track and field† Gymnastics
Hard projectiles, "sticks," close contact Basketball Baseball/softball Cricket Lacrosse (men's and women's) Hockey (field and ice) Squash Racquetball Fencing Intentional injury Boxing Full-contact martial arts	Water polo Football Fishing Golf	Wrestling Bicycling	

* Vinger PF. A practical guide for sports eye protection. *Phys Sports Med.* 2000;28(6). Available at: http://www.physsportsmed.com/issues/2000/06_00/vinger.htm

† Javelin and discus have a small but definite potential for injury. However, good field supervision can reduce the extremely low risk of injury to near-negligible.

specifications include youth baseball batters and base runners (ASTM standard F910), paintball (ASTM standard 1776), skiing (ASTM standard 659), and ice hockey (ASTM standard F513).¹⁰ Other protectors with specific standards are available for football and men's lacrosse.

The 2 types of eyewear that are not satisfactory for eye-injury risk sports include:

1. Streetwear (fashion) spectacles that conform to the requirements of American National Standards Institute (ANSI) standard Z80.3.¹¹
2. Safety eyewear that conforms to the requirements of ANSI standard Z87.1,¹² which is mandated by the Occupational Safety and Health Administration for industrial and educational safety eyewear.

Prescription or nonprescription (plano) lenses may be fabricated from any of several types of clear material, including polycarbonate. Polycarbonate is the most shatter-resistant clear lens material and should be used for all safety eyewear.¹³

PROTECTIVE EYEWEAR CERTIFICATION

Protectors that have been tested to an appropriate standard by an independent testing laboratory are often certified and should afford reasonable protection. The Protective Eyewear Certification Council has begun certifying protectors that comply with ASTM standard F803 (racket sports, basketball, baseball, women's lacrosse, and field hockey), ASTM standard F1776 (paintball), and ASTM standard F910 (youth baseball batters and base runners) standards.¹⁰ The Canadian Standards Association (CSA) certifies products that comply with the Canadian racket-sport standard, which is similar to the ASTM standard.¹⁰ The Hockey Equipment Certification Council (HECC) certifies ice hockey equipment including helmets and face shields. The National Operating Committee on Standards in Athletic Equipment certifies baseball and football helmets as well as the face protectors for men's lacrosse and football.

For those sports with certified protectors, it is recommended that products bearing the Protective Eyewear Certification Council, CSA, HECC, or National Operating Committee on Standards for Athletic Equipment seals be used when available.

RECOMMENDATIONS

1. All youths involved in organized sports should be encouraged to wear appropriate eye protection.
2. The recommended sports-protective eyewear as listed in Table 2 should be prescribed. Proper fit is essential. Because some children have narrow facial features, they may be unable to wear even the smallest sports goggles. These children may be fitted with 3-mm polycarbonate lenses in ANSI standard Z87.1 frames designed for children.¹² The parents should be informed that this protection is not optimal, and the choice of eye-safe sports should be discussed.
3. Because contact lenses offer no protection, it is strongly recommended that athletes who wear contact lenses also wear the appropriate eye protection listed in Table 2.
4. An athlete who requires prescription spectacles has 3 options for eye protection: a) polycarbonate lenses in a sports frame that passes ASTM standard F803 for the specific sport; b) contact lenses plus an appropriate protector listed in Table 2; or c) an over-the-glasses eyeguard that conforms to the specifications of ASTM standard F803 for sports in which an ASTM standard F803 protector is sufficient.¹⁰
5. All functionally 1-eyed athletes should wear appropriate eye protection for all sports.
6. Functionally 1-eyed athletes and those who have had an eye injury or surgery must not participate in boxing or full-contact martial arts. (Eye protection is not practical in boxing or wrestling and is not allowed in full-contact martial arts.) Wrestling has a low incidence of eye injury. Although no standards exist, eye protectors that are firmly

TABLE 2. Recommended Eye Protectors for Selected Sports

Sport	Minimal Eye Protector	Comment
Baseball/softball (youth batter and base runner)	ASTM standard F910	Face guard attached to helmet
Baseball/softball (fielder)	ASTM standard F803 for baseball	ASTM specifies age ranges
Basketball	ASTM standard F803 for basketball	ASTM specifies age ranges
Bicycling	Helmet plus streetwear/fashion eyewear	
Boxing	None available; not permitted in the sport	Contraindicated for functionally 1-eyed athletes
Fencing	Protector with neck bib	
Field hockey (men and women)	ASTM standard F803 for women's lacrosse (goalie: full face mask)	Protectors that pass for women's lacrosse also pass for field hockey
Football	Polycarbonate eye shield attached to helmet-mounted wire face mask	
Full-contact martial arts	None available; not permitted in the sport	Contraindicated for functionally 1-eyed athletes
Ice hockey	ASTM standard F513 face mask on helmet (goaltenders: ASTM standard F1587)	HECC OR CSA certified Full-face shield
Lacrosse (men)	Face mask attached to lacrosse helmet	
Lacrosse (women)	ASTM standard F803 for women's lacrosse	Should have option to wear helmet
Paintball	ASTM standard F1776 for paintball	
Racquet sports (badminton, tennis, paddle tennis, handball, squash, and racquetball)	ASTM standard F803 for selected sport	
Soccer	ASTM standard F803 for selected sport	
Street hockey	ASTM standard 513 face mask on helmet	Must be HECC or CSA certified
Track and field	Streetwear with polycarbonate lenses/fashion eyewear*	
Water polo/swimming	Swim goggles with polycarbonate lenses	
Wrestling	No standard available	Custom protective eyewear can be made

* Eyewear that passes ASTM standard F803 is safer than streetwear eyewear for all sports activities with impact potential.

fixed to the head have been custom made. The wrestler who has a custom-made eye protector must be aware that the protector design may be insufficient to prevent injury.

7. For sports in which a face mask or helmet with an eye protector or shield must be worn, it is strongly recommended that functionally 1-eyed athletes also wear sports goggles that conform to the requirements of ASTM standard F803 (for any selected sport).¹⁰ This is to maintain some level of protection if the face guard is elevated or removed, such as for hockey or football players on the bench. The helmet must fit properly and have a chinstrap for optimal protection.
8. Athletes should replace sports eye protectors that are damaged or yellowed with age, because they may have become weakened and are, therefore, no longer protective.

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RESOURCES

American Academy of Ophthalmology, Communications Department, PO Box 7424, San Francisco, CA 94120-7424.

Prevent Blindness America (formerly National Society to Prevent Blindness), 500 E. Remington Rd, Schaumburg, IL 60173.

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