

Protective Eyewear for Young Athletes

American Academy of Pediatrics, Committee on Sports Medicine and Fitness, American Academy of Ophthalmology, Eye Health and Public Information Task Force

American Academy of Pediatrics and the 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 one-eyed and for athletes whose ophthalmologists recommend eye protection after eye surgery or trauma. *Ophthalmology* 2004;111:600–603 © 2004 by the American Academy of Ophthalmology.

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, and 8% occurred in children younger than 5.¹ 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 them. 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 avail-

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 East Remington Road, Schaumburg, IL 60173.

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ability 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 properly fitted.^{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 one-eyed wear appropriate eye protection during all sports, recreational, and work-related activities. Functionally one-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 one-eyed athletes may be severely handicapped 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 also 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 both in the way they fit and in 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 are:

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 F803 eyewear is inadequate.

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

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

*Vinger PF. A practical guide for sports eye protection. *Physicians Sportsmed* 2000;28(b).

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

Those for which there are standard specifications include youth baseball batters and base runners (ASTM F910), paintball (ASTM F1776), skiing (ASTM F659), and ice hockey (ASTM 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 are:

1. Streetwear (fashion) spectacles that conform to the requirements of American National Standards Institute Standard Z80.3.¹¹
2. Safety eyewear that conforms to the requirements of American National Standards Institute 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 the ASTM F803 (racket sports, basketball, baseball, women's lacrosse, and field hockey), ASTM F1776 (paintball), and ASTM F910 (youth baseball batters and base runners) standards.¹⁰ The Canadian Standards Association certifies products that comply with the Canadian racket sport standard, which is similar to the ASTM standard.¹⁰ The Hockey Equipment Certification Council certi-

fies 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, Canadian Standards Association, Hockey Equipment Certification Council, or National Operating Committee on Standards in Athletic Equipment seals be used when available.

Recommendations

1. All youth 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 American National Standards Institute 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 F803 for the specific sport, (b) contact lenses plus an appropriate protector listed in Table 2, or (c) an over-the-glasses eye guard that conforms to the specifications of ASTM F803 for sports in which an ASTM F803 protector is sufficient.¹⁰

Table 2. Recommended Eye Protectors for Selected Sports

Sport	Minimal Eye Protector	Comment
Baseball/softball (youth batter and base runner)	ASTM F910*	Face guard attached to helmet
Baseball/softball (fielder)	ASTM F803 for baseball*	ASTM specifies age ranges
Basketball	ASTM F803 for basketball*	ASTM specifies age ranges
Bicycling	Helmet plus streetwear/fashion eyewear	
Boxing	None available; not permitted in sport	Contraindicated for functionally one-eyed athletes
Fencing	Protector with neck bib	
Field hockey (men's and women's)	ASTM 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 sport	Contraindicated for functionally one-eyed athletes
Ice hockey	ASTM F513 face mask on helmet;* goaltenders, ASTM F1587*	HECC or CSA certified; full-face shield
Lacrosse (men's)	Face mask attached to lacrosse helmet	
Lacrosse (women's)	ASTM F803 for women's lacrosse*	Should have option to wear helmet
Paintball	ASTM F1776 for paintball*	
Racquet sports (badminton, tennis, paddle tennis, handball, squash, and racquetball)	ASTM F803 for selected sport*	
Soccer	ASTM F803 for selected sport*	
Street hockey	ASTM F513 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

ASTM = American Society for Testing and Materials; CSA = Canadian Standards Association; HECC = Hockey Equipment Certification Council. *Annual Book of ASTM Standards: Vol. 15.07. Sports Equipment; Safety and Traction for Footwear; Amusement Rides; Consumer Products. West Conshohocken, PA: ASTM International; 2003.

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

- All functionally one-eyed athletes should wear appropriate eye protection, for all sports.
- Functionally one-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 fixed to the head have been custom made. The wrestler who has a custom eye protector made must be aware that the protector design may be insufficient to prevent injury.
- For sports in which a facemask or helmet with an eye protector or shield must be worn, it is strongly recommended that functionally one-eyed athletes also wear sports goggles that conform to the requirements of ASTM 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.
- 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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