ABSTRACT. In-line skating has become one of the fastest-growing recreational sports in the United States. Recent studies emphasize the value of protective gear in reducing the incidence of injuries. Recommendations are provided for parents and pediatricians, with special emphasis on the novice or inexperienced skater.

Since its introduction in 1980, in-line skating has become one of the fastest growing recreational sports for children and teenagers in the United States. An estimated 17.7 million people younger than 18 years participated in this sport in 1996, a 24% increase over the previous year. The sport offers the benefits of aerobic fitness, independent transportation for younger children, the opportunity to play roller hockey or cross-train for other sports, and venues for competition in artistic, speed skating, and endurance events. Entry-level skates now cost less than $20 per pair, a 10-fold decrease in the past decade. The low cost and multiple benefits of participation have allowed the sport to thrive beyond the limits of a “fad,” as evidenced by the existence of a professional roller hockey league, in-line speed skating competition at the Pan American Games, trick-skating competition at the Entertainment and Sports Programming Network (ESPN) Extreme Games, several periodicals for enthusiasts, an international skaters association, a formal training program for instructors, and summer training camps.

As the sport has grown, so has the number of participants injured. In 1996, an estimated 76,000 children and teenagers younger than 21 years were injured sufficiently while in-line skating to require emergency department care, compared with about 415,000 bicyclists. The most common reasons cited for injuries during in-line skating were losing one’s balance because of a road defect or debris, being unable to stop, out-of-control speeding, or doing a trick. In one study, novice skaters incurred 14% of all injuries requiring treatment. The wrist is the most common site of injury (37% of all injuries), and two thirds of wrist injuries are fractures. Few skaters die. Of a total of 36 who died since 1992, the US Consumer Product Safety Commission Clearinghouse reported that 31 had collided with a motor vehicle.

Wearing proper gear is essential for safe skating. This includes a helmet, wrist guards, knee pads, and elbow pads. Wrist guards are designed to prevent wrist injuries by preventing sudden extreme hyperextension, absorbing some shock of impact, dissipating kinetic forces by forward sliding on their hard volar plates, and preventing local gravel burns. A helmet, elbow pads, and knee pads are recommended for shock absorption. Recent research has evaluated the effectiveness of such gear and indicates that wearing wrist guards could reduce the number of wrist injuries by 87%, wearing elbow pads could reduce the number of elbow injuries by 82%, and wearing knee pads could reduce the number of knee injuries by 32%. Although in this study the number of in-line skaters who sustained a head injury was not sufficient to determine the degree of protection afforded by helmets, others have reported that a bicycle helmet or similar approved sports helmet is strongly protective against the occurrence of a head injury to bicyclists in the same physical environment to which a skater is exposed. Helmet use by child and adolescent skaters is required by law in New York and Oregon. Skaters who participate in roller hockey or perform tricks should wear heavy-duty protective gear, including well-constructed wrist guards, knee pads, elbow pads, and a full-head helmet that covers the ears.

“Truck-surfing” or “skitching” refers to skating behind or alongside a vehicle while the skater holds on to the vehicle. This enables a skater to travel at the same velocity as the vehicle. However, it can be very dangerous because the skater cannot slow down fast enough to prevent colliding with the vehicle or being thrown into oncoming traffic or the roadbed if the vehicle suddenly slows, stops, or turns. If the skater falls, his or her enhanced momentum will likely result in a greater force of impact, and consequently, a more severe injury. Several deaths have been caused by skitching.

The design of the skates should match the ability of the skater. Three- or four-wheeled skates are suitable for novice- or intermediate-level skaters, depending on the child’s foot size. Five-wheeled skates are high-performance, extremely low-friction skates that should be used only by competitive or long-distance skaters. Skates should fit snugly to allow good, responsive control. Skates, whether rented or owned, should be well maintained: the brake pads should not be worn down, the wheels should be worn symmetrically and turn freely. Skates with expandable shells or interchangeable liners are now available to accommodate the child’s growing foot.

Skating skill is not acquired easily or quickly. Good balance and speed control are essential skills to learn. In the past, children acquired skating skills on
traditional “quad” skates, rather than in-line skates, but that pattern appears to be changing. The age at which children are ready to use in-line skates safely is not known with certainty because a combination of factors are involved: physical factors (foot size and body strength); skill factors (general athletic ability and large-muscle coordination); and behavioral factors (vigilance in watching the surface for debris and defects, sufficient attention to traffic, judgment). Although most 7- and 8-year-olds can acquire the skills needed to in-line skate, some children may acquire these skills earlier or later. Judgment and ability to avoid obstacles, including bicyclists, pedestrians, and other skaters, are needed. Training may help the novice learn the sport; more than 2000 certified instructors now teach in the United States.

With either type of skate, the novice should preferably learn indoors at a skating rink, where surface conditions, speed, and lighting are controlled without the presence of motor vehicle traffic or other obstacles. Novices particularly need a flat, smooth surface free of debris.

Once a skater can control speed and direction on an indoor rink, he or she is ready to skate on a path or open lot. Hills (even small ones) should be avoided at first. The path selected should be isolated from motor vehicle, bicycle, and pedestrian traffic to the greatest extent possible until the skater is competent enough to avoid such obstacles. Separate trails are advisable wherever possible. Trail designs have been published, including recommendations for design speed, surface composition, drainage, trail width, and sight distances. Trails should be kept free of sand, dirt, leaves, and twigs, which can become trapped between the wheels and cause a sudden change in velocity with loss of balance. Good drainage is needed so that puddles do not form—water changes the coefficient of friction and results in a sudden change in velocity. Trails should also flatten for at least 30 ft before intersections.

RECOMMENDATIONS

The American Academy of Pediatrics recommends that pediatricians provide the following advice to patients and families concerned with this activity:

1. Parents need to understand both the benefits and risks of in-line skating. Children and their parents should appreciate that injuries are particularly common in novice skaters, roller hockey players, and those performing tricks.
2. Full protective gear needs to be used at all times, including a helmet, wrist guards, knee pads, and elbow pads. The helmet should be certified by the American National Standards Institute (ANSI), the American Society for Testing and Materials (ASTM), the Snell Memorial Foundation, or the Consumer Product Safety Commission. Skaters performing tricks need special heavy-duty protective gear.
3. If skating takes place on the streets, pediatricians should strongly encourage parents, children, and adolescents to use streets that are blocked off or closed to through traffic (eg, dead-end streets or cul-de-sacs).
4. Special attention should be paid to the needs of novice skaters to avoid injuries. They should skate on an indoor or outdoor rink, rather than on a path or street. Inexperienced children should not attempt to do tricks.
5. “Truck-surfing” or “skitching” should be prohibited for all skaters under any circumstance.
6. The type and fit of the skates should be carefully considered when they are purchased or rented and should be appropriate for the child’s size, ability, and purpose.
7. Skaters should vigilantly watch for road debris and defects, which may precipitate a loss of balance. They should be trained to react appropriately to these and other rapidly occurring and unpredictable circumstances by learning to stop quickly and fall safely and by avoiding traffic. Instruction in skating by a teacher certified by the International In-Line Skating Association is recommended.
8. Children with large-muscle motor skill or balance problems and those with any uncorrected hearing or vision deficit should skate only in a protected environment. Appropriate areas include a skating rink or outdoor area where the skater is either alone or where no motor vehicle or bicycle traffic occurs and where all other skaters and pedestrians travel in the same direction.
9. State legislation that requires helmet use while skating should be encouraged.

Committee on Injury and Poison Prevention, 1997 to 1998
Muray L. Katcher, MD, PhD, Chairperson
Phyllis Agran, MD, MPH
Danielle Laraque, MD
Susan H. Pollack, MD
Barbara L. Smith, MD
Gary A. Smith, MD, DrPh
Howard R. Spivak, MD
Susan B. Tully, MD

Liaison Representatives
Ruth A. Brenner, MD
National Institute of Child Health and Human Development
Stephanie Bryn, MPH
Maternal and Child Health Bureau
William P. Tully, MD
Pediatric Orthopaedic Society of North America
Cheryl Neverman
US Dept of Transportation
Richard A. Schieber, MD, MPH
Centers for Disease Control and Prevention
Richard Stanwick, MD
Canadian Paediatric Society
Deborah Tinsworth
US Consumer Product Safety Commission

Section Liaisons
Marilyn Bull, MD, MPH
Section on Injury and Poison Prevention
Victor García, MD
Section on Surgery

Committee on Sports Medicine and Fitness, 1997 to 1998
Steven J. Anderson, MD, Chairperson
Stephen P. Bolduc, MD
REFERENCES


In-line Skating Injuries in Children and Adolescents
Committee on Injury and Poison Prevention and Committee on Sports Medicine and Fitness

Pediatrics 1998;101;720

Updated Information & Services
including high resolution figures, can be found at:
/content/101/4/720.full.html

Citations
This article has been cited by 13 HighWire-hosted articles:
/content/101/4/720.full.html#related-urls

Subspecialty Collections
This article, along with others on similar topics, appears in the following collection(s):
Council on Injury, Violence, and Poison Prevention
/cgi/collection/committee_on_injury_violence_and_poison_prevention
Council on Sports Medicine and Fitness
/cgi/collection/council_on_sports_medicine_and_fitness

Permissions & Licensing
Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:
/site/misc/Permissions.xhtml

Reprints
Information about ordering reprints can be found online:
/site/misc/reprints.xhtml

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 1998 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.
In-line Skating Injuries in Children and Adolescents
Committee on Injury and Poison Prevention and Committee on Sports Medicine and Fitness
Pediatrics 1998;101;720

The online version of this article, along with updated information and services, is located on the World Wide Web at:
/content/101/4/720.full.html