United States
CONSUMER PRODUCT SAFETY COMMISSION
Washington, D.C. 20207

MEMORANDUM

DATE: December 18, 1996

TO : The Commission
Sadye E. Dunn, Secretary

FROM : Eric A. Rubel, General Counsel
Stephen Lemberg, Assistant General Counsel
Allen F. Brauninger, Attorney, OGC

SUBJECT: Petition HP 95-1 requesting development of a rule to face guards on children's batting helmets

VOTE SHEET

A petition from the American Academy of Facial Plastic and Reconstructive Surgery (HP 95-1) requests the Commission to issue a rule requiring batting helmets intended for children younger than 15 years of age to be manufactured with a face guard that conforms with the Safety Specification for Face Guards for Youth Baseball (ASTM F910) published by ASTM (formerly the American Society for Testing and Materials). A briefing package from the staff discusses information developed by the staff and obtained from comments on the petition. The staff recommends that the Commission write to the organized youth baseball leagues encouraging those associations to require the use of batting helmets with face guards. The staff recommends further that the Commission not grant the petition at this time.

Please indicate your vote:

I Grant the petition; direct the staff to draft an advance notice of proposed rulemaking to begin the rulemaking proceeding requested by the petition.

Signature Date

NOTE: This document has not been reviewed or accepted by the Commission.
Initial rcc Date 12/19/96

CPSA § (b)(1) Cleared
12/19/96
No Mfrs/PrivLbls or Products identified
Excepted by

II Deny the petition; direct the staff to draft a letter of denial to the petitioner.

_____ Signature _____ Date

III Defer a decision to grant or deny the petition.

_____ Signature _____ Date

IV Direct the staff to write to the organized youth baseball leagues to encourage those associations to require the use of batting helmets with face guards.

[This option may be chosen in addition to options I, II, or III.]

_____ Signature _____ Date

V Take other action (please specify):

_____

_____

_____

_____ Signature _____ Date

Briefing Package
Petition on Youth Batting Helmet Face Guards

For Additional Information, Contact
Susan B. Kyle, Ph.D., Project Manager
Directorate for Epidemiology and Health Sciences
301 504-0470 x 1210

NOTE: This document has not
reviewed or accepted by the Commission
Initial _____ Date 12/19/96

CPSA 6 (b)(1) Cleared
12/19/96
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Not Identified

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Executive Summary

The American Academy of Facial Plastic and Reconstructive Surgery has petitioned the U.S. Consumer Product Safety Commission (CPSC) to require that protective batting helmets intended to be used by children under the age of 15 be manufactured with a face guard that conforms to ASTM F910 "Standard Specification for Face Guards for Youth Baseball". In July 1995 the Commission voted to defer granting or denying this petition until the results of a staff special study of baseball injuries to children in 1995 became available.

The results of the special study indicated that there were an estimated 162,100 baseball-, softball-, and tee-ball-related emergency room treated injuries to children ages 5-14 in 1995. Approximately 37 percent of these injuries were facial injuries. Approximately 13 percent of all facial injuries (about 4,600 injuries) occurred to batters or baserunners in organized play, i.e., occurred in circumstances where a batting helmet face guard would reasonably be expected to prevent the injury.

Comments received on the August 6, 1996, Federal Register notice concerning the petition covered a wide spectrum of positions. One commenter felt that mandating face guard use was beyond the scope of the Commission's statutory authority since sport-related injury does not constitute unreasonable risk. Other commenters argued that eye, oral and facial injuries are among the most expensive but could be easily prevented by the use of batting helmet face guards. Data submitted from the insurance company of the youth league which currently requires face guards on batting helmets indicated that use of the face guards on batting helmets reduced insurance claims related to facial injuries. Several commenters, including USA Baseball (the National Governing Body for amateur baseball), stated that mandating the use of face guards should be delayed until efficacy and acceptability are demonstrated by scientific study.

CPSC staff analysis of the economic effects associated with the use of face guards indicated that, based on available information, the net benefits of face guard use are about 10 to 11 times the cost.

Staff recommends that the Commission write a letter to the youth leagues transmitting the information from the CPSC staff study and recommending that the youth leagues require the use of face guards on batting helmets. Staff also recommends that the Commission not grant the petition at this time but either deny the petition or defer a decision until the youth leagues respond to the agency's request that they require the use of face guards.

United States
CONSUMER PRODUCT SAFETY COMMISSION
Washington, D.C. 20207

MEMORANDUM

DEC 18 1996

TO: The Commission
Sadye E. Dunn, Secretary

THROUGH: Eric B. Rubel, General Counsel
Pamela Gilbert, Executive Director PG

FROM: Ronald L. Medford, Assistant Executive Director RLM
Office of Hazard Identification and Reduction
Susan B. Kyle, Ph.D., Project Manager
Directorate for Epidemiology and Health Sciences

SUBJECT: HP95-1: Petition for Development of a Safety Standard for Batting Helmet Face Guards

I. Introduction

In July 1995 the Commission voted to defer granting or denying petition HP95-1: "Petition for the Development of a Safety Standard to Require Face Guards on Protective Batting Helmets" until the results of a staff special study of baseball injuries became available. This memorandum presents the results of that study which are pertinent to the petition. It also includes additional information submitted since the Commission's earlier consideration, and presents a staff recommendation concerning the petition.

II. Background

Information relevant to HP95-1: "Petition for the Development of a Safety Standard to Require Face Guards on Protective Batting Helmets" was provided to the Commission in a briefing package dated June 16, 1995. The petition (TAB A) was submitted by the American Academy of Facial Plastic and Reconstructive Surgery and requested that the Commission "adopt a consumer product safety standard ... requiring that all protective batting helmets intended to be used by children under the age of 15 be manufactured with a face guard that conforms to Standard F910 of the American Society for Testing and Materials".

The petition included a copy of ASTM standard F910 and other supporting documents reporting deaths and injuries associated with baseball.

NOTE: This document has not been reviewed or accepted by the Commission.
Initial rle Date 12/19/96

CPSA 6 (b)(1) Cleared
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No Mfrs/PrvtLblrs or Products Ider

The petition was docketed under the Federal Hazardous Substances Act (FHSA). Under this Act, in order to issue the rule requested by the petitioner, the Commission would have to find that a batting helmet presents a mechanical hazard unless it has a face guard.

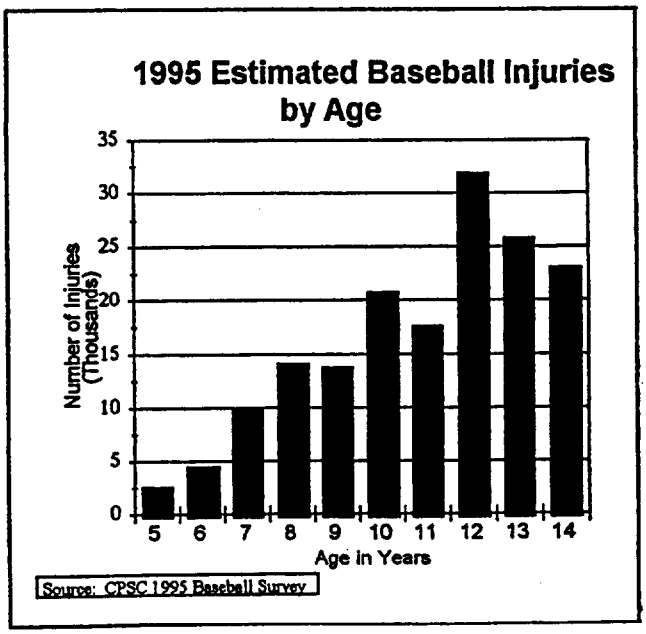
In the June 1995 briefing package, the Directorate for Economic Analysis (EC) estimated that as many as 13 million children may play baseball or softball at least once a year not in association with any league. In addition, approximately five to six million children between the ages of 5 and 14 participate in organized baseball or softball. All youth leagues currently require the use of a batting helmet. Only one league requires the use of face guards on batting helmets. An estimated 125,000 to 200,000 face guards are sold annually, with a retail cost per unit of approximately $10.00.

EC identified seven manufacturers of face guards. All but one of the currently manufactured face guards is advertised as meeting the existing ASTM voluntary standard.

In the June 1995 briefing package, the Division of Human Factors noted that it might be difficult to define a youth batting helmet because the head size of older children is not significantly different from that of adults. This could result in the same size helmet being offered for sale as a youth helmet with a faceguard at one price and as an adult helmet without a faceguard at an equal or lower price. In addition, although face guards have been available for approximately twenty years, only one youth league currently requires their use. Reasons generally cited for not currently requiring the use of face guards include cost, lack of necessity, possible limitations on vision, and changing the nature of the game of baseball.

III. Facial Injury Information

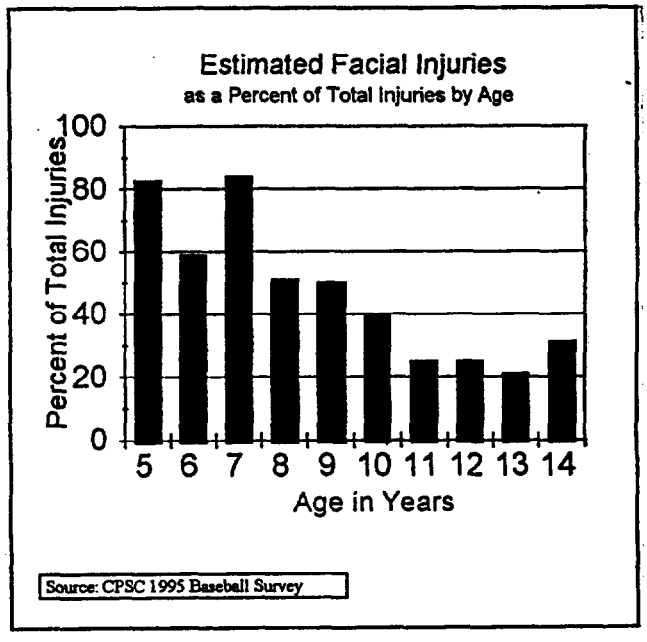
The results of the staff's 1995 Baseball Injury Survey were published in the Youth Baseball Protective Equipment Project Final Report in May 1996. The most pertinent data related to batting helmet face guards are included at TAB B and summarized below.



In 1995, there were an estimated 162,100 emergency room-treated injuries to children between the ages of 5 and 14 which were related to baseball, softball, and tee-

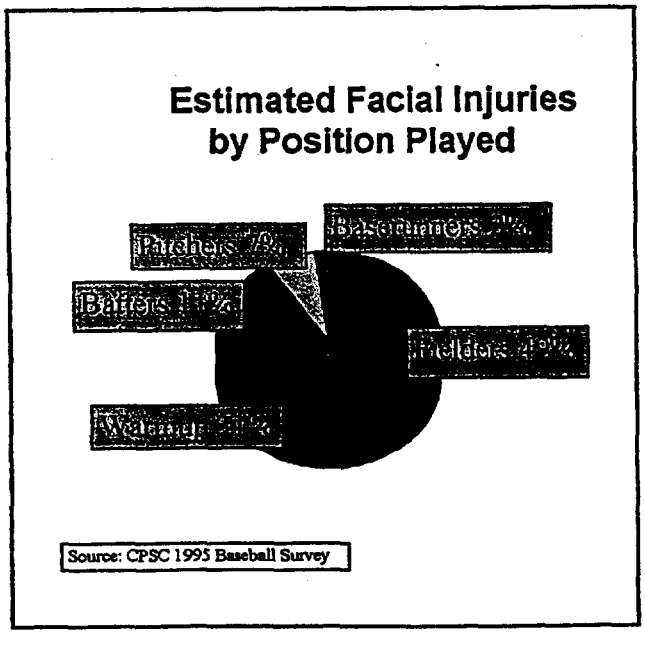
ball. The figure on the previous page shows the number of injuries for each age between 5 and 14.

The number of injuries generally increased with increasing age up to age 12. In general, baseball participation increases between the ages of 6 and 12. So the observed increase in the number of injuries between 6 and 12 may be due simply to increased numbers of children participating, rather than an increase in risk of injury for each participant.



For all ages combined, approximately 37 percent of the estimated hospital emergency room-treated baseball-related injuries (59,400 injuries) were facial injuries. The percent of baseball-related injuries which were facial injuries is shown for each year of age in the figure at the right. For ages 5 through 9, the majority of all baseball-related injuries were facial injuries.

Of the 59,400 facial injuries to all ages, approximately 74 percent (44,000) were due to being hit by the ball. Within this group, about 80 percent (35,200) occurred during organized play. The distribution of facial injuries by position played at the time of injury is shown in the figure at the left. Almost half the injuries occurred to players in the field. Almost one-third occurred to players warming up. Approximately 11 percent of organized play facial injuries (3,900 injuries) occurred to batters and about 2 percent to baserunners (700 injuries). Therefore, approximately 13 percent of all facial injuries occurred under circumstances where a batting helmet face guard would reasonably be



expected to prevent the injury. This distribution appeared to be roughly similar for all ages studied (see Table 13 in TAB B).

Approximately 16 percent of organized play batters in this survey reported wearing a batting helmet face guard. Since this was a survey of injured players only, this may not represent face guard use by all batters. None of the facial injuries reported in this survey occurred to a player wearing a batting helmet with a face guard.

In addition, staff is aware of 21 deaths in the 5-14 year old age group due to being struck in the head by the ball, approximately one death per year from 1973 through 1995. Of these 21 deaths, 7 occurred in organized play, 6 occurred in unorganized play, and 8 occurred in unknown circumstances.

IV. ASTM Standard Revisions

The petitioner requested that the required face guard meet ASTM F910 "Standard Specification for Face Guards for Youth Baseball". Revisions to F910 were balloted in September 1996 in the following areas:

- The type of headform to be used for testing the face guard/helmet assembly was changed to a more widely used, more readily available type of headform.
- "No-contact" and "guard-contact-only" areas of the headform face were specified for testing procedure. This sets pass/fail criteria which are based on no chin strap use, which is consistent with the way batting helmets are worn in play.
- A requirement was added that face guards being offered for sale include detailed instructions on emergency removal.

CPSC staff had no comment on these revisions, since they would likely result in a standard which assures at least as much safety as the current standard.

V. Comments Received Subsequent to the July 1995 Vote to Defer

Subsequent to the July 1995 Commission vote to defer a decision on the petition, several comments were received on the issue of batting helmet face guards. These submissions are included at TAB C.

The law firm of Wiley, Rein & Fielding submitted items on July 26, 1995, and April 17, 1996, on behalf of Dr. Robert Crow of C-Flap, Inc. C-Flap makes a batting helmet face guard which

does not meet the ASTM standard. These submissions argued that face guard designs other than the C-Flap impose visual field limitations on the wearer that might dangerously impair the ability to perceive and react to a baseball. In addition, these other face guards do not permit access to airways. This could become life threatening in an situation where breathing was compromised and the batting helmet could not or should not be removed, such as a cervical spine fracture.

TAB C also contains a submission by Dr. Paul Vinger, Director, New England Eye Center. Dr. Vinger reported that the results of visual field testing he performed and his knowledge of the use of face guards on the playing field led him to conclude that the visual field defects he observed "neither pose a safety problem nor interfere with performance". He noted that one Little League team won the Little League World Series wearing face guards, and that many other sports, such as ice hockey, use face guards which have been shown to be effective and have not been associated with any injury due to visual field limitations. He concluded that any visual field limitations face guards may impose are of no practical significance.

VI. Second Federal Register Notice and Comments

On August 6, 1996 the Commission published a Federal Register Notice soliciting comments on petition HP95-1 in light of the staff's final report on baseball protective equipment (TAB D). Ten comments were received. These comments are included at TAB E and are summarized below.

Mr. Mark Strauch of Livermore, CA, reiterated his earlier comments urging rejection of the petition. Mr. Strauch stated that risk of injury is inherent in sport and that this risk is not an unreasonable risk. Therefore, CPSC has no statutory basis to intervene. He rejected CPSC staff's earlier argument that making the sport safer could be seen as a legitimate function of the CPSC.

Dr. Paul Vinger, Director, New England Eye Center, stated that in his opinion the existing ASTM standard is adequate to prevent injuries and that a mandatory rule is unnecessary at this time. He stated that "there have been no known injuries to the eye or face in any of the approximately 500,000 players wearing protectors meeting the specifications of ASTM F910, which have been mandated in the Dover, NH, South Side Little League and the Dixie Little League." Dr. Vinger indicated in a subsequent phone conversation that he felt that a more effective approach would be to strongly recommend the use of the face guard, conduct studies to document the effectiveness of face guards, and then use the effectiveness data to lobby the leagues to require face guard use.

Dr. John A. Bogert, DDS, Executive Director of the American Academy of Pediatric Dentistry, stated that the Academy "strongly supports the development of a safety standard that would require use of a face guard on batting helmets for all children participating in baseball, softball and T-ball". He stated that face guards are effective, not expensive, and do not compromise vision or airways. He stated that "to knowingly put children in danger of serious injury when simple affordable devices exist to prevent that injury is cavalier at best."

Three pediatric dentists also wrote in support of granting the petition: Dr. C.R. Castaldi, Professor Emeritus of Pediatric Dentistry at the University of Connecticut Health Center; Dr. Monica H. Cipes, a dentist in private practice; and Dr. Stephen C. Mills, Liaison, American Academy of Pediatric Dentistry to the Academy for Sports Dentistry. All three commented on the effectiveness of face guards in preventing oral, facial and eye injuries.

USA Baseball, a member of the U.S. Olympic Committee, is the national governing body for all amateur baseball in the U.S., including the youth leagues. Dr. Barry Goldberg, of the Medical and Safety Advisory Committee of USA Baseball, commented on the petition. Dr. Goldberg stated that it is "premature to mandate safety equipment before scientific study has demonstrated efficacy and acceptability by participants." He cited several additional areas of concern: the need for a study comparing the frequency of facial injuries with and without face masks, including some measure of severity of injury; the need for standards with requirements at different ball speeds using varying types of balls; the effect of the face guard on the player; and consideration of cost, including litigational problems. He concluded by saying that "with the information currently available, face masks that meet standards should certainly be permitted and probably recommended, particularly for the under 10 year old group. They should not be mandated for the issues previously presented ..."

Mr. John M. Sadler, President of Sadler & Company, also commented. Mr. Sadler is the Risk Manager for Dixie Baseball, Inc., and his company is the endorsed insurance company for the Dixie youth baseball leagues, the only leagues which currently require the use of face guards on batting helmets. Mr. Sadler submitted data his company had collected on excess insurance claims for injuries in the 1994 and 1995 playing seasons for the Dixie Youth Baseball league for 5 to 12 year olds. (Excess insurance claims do not include injuries where the injured participants sought payment only from their primary insurance carrier.) Mr. Sadler estimated that approximately 33 percent of the teams were using batting helmet face guards during the 1994 season. In 1995 all teams used batting helmet face guards.

There were 26 facial injury claims by offensive players (batters and baserunners) during the 1994 season; this was 5.8 percent of all injury claims. During the 1995 season there were 3 claims for facial injury by offensive players, 0.7 percent of all claims. Mr. Sadler reported that they have only two recorded injuries where the face guard did not prevent injury. Both these cases were collisions between a baserunner and the baseman. In both cases, the face guard was pushed into the face of the baserunner. Mr. Sadler stated that "it could be argued that the injury would have been much more severe without the presence of the faceguard."

Drs. Kenneth Veenema and Joel Pasternack submitted comments which included their recently published article "Baseball Injuries: A Little League Survey" (*Pediatrics* 98: 445-448, 1996). They studied coach-reported injuries in two Little League baseball leagues involving over 2,800 players ages 7 to 18 during the 1994 season. Of the 18 ball-related facial injuries which occurred in their study, 16 were to players on defense. Only two were to batters or baserunners. This is in close agreement with the results of CPSC staff's study of 1995 injuries where 13 percent of facial injuries occurred to batters and baserunners. These researchers commented that requiring mandatory face guards on batting helmets is unwarranted since they do not protect the players most at risk of facial injuries, the defensive players.

Mr. Joseph Cooper, President, American Amateur Baseball Congress, also commented. Mr. Cooper raised a number of issues involved in requiring the use of face guards, including cost, sanitation, effect on the nature of the game, and possible potential to cause sliding injuries. He stressed the need for thorough field testing to determine the feasibility and practicality of requiring face guards. He volunteered to cooperate with CPSC in any way possible to improve safety for players.

VII. Economic Effects of Face Guard Use

The Directorate for Economic Analysis (TAB F) estimated that the costs of all medically-treated injuries (not only emergency room visits) resulting from ball impact to the face of batters during organized play in 1995 was $35.8 million. During this time there were an estimated 2.4 million batting helmets in use that were not equipped with face guards.

Based on these figures, the estimated injury cost per helmet without a face guard is $14.63 per year. Use of a face guard on these helmets would result in an estimated $99 to $119 in

benefits per helmet (eliminated injury costs) over the 10 year life of the helmet. Face guards carry a unit retail cost of about $10. Therefore, the net benefits of face guard use are about 10 to 11 times the cost.

VIII. Discussion

The comments received can be divided into the following general categories: the need for protection, the effectiveness of protection, player acceptability, and the potential disadvantages of protection. Each of these categories will be discussed briefly.

Need for protection. One commenter noted that the risk of injury is inherent in sports participation, and that this risk is not unreasonable. Others noted that protecting the faces of batters and baserunners does not protect the group most at risk, the defensive players. In contrast, commenters in favor of mandating the use of face guards noted that oral, facial and eye injuries tend to be psychologically and economically expensive injuries which could easily be prevented by the use of face guards.

Effectiveness of protection. Both the USA Baseball commenter and the American Amateur Baseball Congress commenter called for studies demonstrating the level of effectiveness of face guards before mandating their use. Data presented by Sadler & Company showed reduced incidence of insurance claims for facial injuries when all players were required to use a batting helmet face guard. In addition, CPSC staff's study found that none of the facial injuries reported occurred to a player wearing a batting helmet with a face guard.

Player acceptability. Several commenters raised the issue of the acceptability of batting helmet face guards to players. Mr. Sadler mentioned no problems with player acceptability where the use of the face guards is required. Other commenters cited the acceptability of face guards in other sports such as ice hockey.

Potential disadvantages of protection. Two potential disadvantages of face guards meeting the ASTM standard have been raised: visual field limitation and airway access limitation. One commenter noted that the need for emergency airway access is highly unlikely. This is particularly true since baseball is not a contact sport such as football. Nevertheless, the ASTM standard revisions which are currently balloted include requiring that helmets being offered for sale include detailed instructions on emergency removal.

The exact extent of visual field limitation which is posed by face guards meeting the ASTM standard is unclear given the conflicting information presented by Drs. Crow and Vinger. Dr. Vinger argues that the visual field limitation which may exist is of no real practical significance. He noted that a team which won the Little League World Series used batting helmet face guards and that other sports such as ice hockey successfully use face guards. One commenter noted that a professional player had a successful batting streak after beginning to use a face guard.

IX. Summary

There were an estimated 4,600 ball-impact facial injuries to offensive players (3,900 to batters and 700 to baserunners) treated in hospital emergency rooms in 1995. This represents about 13 percent of all ball-impact facial injuries to players in organized play. Many, if not all, of these injuries could be prevented by the use of batting helmet face guards.

Insurance industry injury claim data indicated that, in the one league which required batting helmet face guard use, use of the face guard resulted in reduction of claims for facial injuries to offensive players from 5.8 percent of all injury claims to 0.7 percent of total injury claims. This insurance company concluded that mandating the use of face guards was a wise decision.

Comments received on the petition covered a wide spectrum of positions. One commenter felt that mandating face guard use was beyond the scope of the Commission's statutory authority since sport-related injury does not constitute unreasonable risk. Several commenters, including the National Governing Body for amateur baseball, stated that mandating the use of face guards should be delayed until efficacy and acceptability are demonstrated by scientific study. Other commenters argued that eye, oral and facial injuries are among the most expensive but could be easily prevented by the use of batting helmet face guards.

X. Conclusions and Recommendation

Available information from the CPSC special study and from the insurance industry indicates that face guards are effective in preventing facial injuries. However, they have not been widely accepted. Face guards have been available for approximately 20 years, but only one youth league currently requires their use. While CPSC could require that helmets be manufactured with face guards, this alone would not ensure their use. The youth leagues, as governing bodies of the sport, have the authority to require the use of protective equipment. A more

effective strategy for ensuring use of face guards might be to request that the youth leagues require their use.

Therefore, staff recommends that the Commission write a letter to the youth leagues transmitting the information from the CPSC staff study and recommending that they require the use of face guards on batting helmets. Staff also recommends that the Commission not grant the petition at this time but either deny the petition or defer a decision until the youth leagues respond to the agency's request that they require the use of face guards.

A

BEFORE THE CONSUMER PRODUCT SAFETY COMMISSION

IN RE:	)	
	)	
RULEMAKING REGARDING	)	DOCKET NO. _____
FACE GUARDS FOR CHILDREN'S	)	
BASEBALL AND SOFTBALL	)	
BATTING HELMETS	)	

PETITION FOR RULEMAKING

The American Academy of Facial Plastic and Reconstructive Surgery, through counsel, pursuant to 16 C.F.R. Part 1051, files the following Petition for Rulemaking:

1.

Petitioner is the American Academy of Facial Plastic and Reconstructive Surgery (the "Academy"), whose address is 1110 Vermont Avenue, Suite 220, Washington, D.C. 20005. Petitioner's phone number is (202) 842-4500.

2.

The Academy requests that the Commission adopt a consumer product safety standard pursuant to 15 U.S.C. § 2056 requiring that all protective batting helmets intended to be used by children under the age of 15 be manufactured with a face guard that conforms to Standard F910 of the American Society for Testing and Materials.

3.

The Academy is a national Medical Specialty Society of the American Medical Association, representing the specialty of facial plastic and reconstructive surgery in that organization's House of Delegates. The Academy's by-laws require that its fellows have achieved certification by one of the recognized specialty boards of

the American Board of Medical Specialties and have achieved membership in the American College of Surgeons. The Academy's members treat traumatic injuries of the face and have a strong interest in preventing such injuries.

4.

Pursuant to 15 U.S.C. § 2056, the Commission has the authority to adopt consumer product safety standards that are reasonably necessary to prevent or reduce an unreasonable risk of injury associated with a product. The evidence available to the Commission demonstrates that the use by children under the age of 15 of batting helmets without face guards creates an unreasonable risk of injury. An article published by the Committee on Sports Medicine and Fitness of the American Academy of Pediatrics in the April 1994 edition of Pediatrics notes that being struck by a pitched ball is a leading cause of sports-related eye injuries to children. See Attachment 1. That article also cites statistics compiled for the Commission which show that during the period 1986 to 1990, head and neck injuries caused more than one baseball- or softball-related death per year. Id. at p. 690. A September 1989 article in Pediatrics (Attachment 2) notes that batting-related injuries are "the leading cause of sports-related eye injuries seen in emergency rooms. Id. at p. 3.

5.

Both of the attached articles from Pediatrics note that the Sports Eye Safety Committee of the National Society to Prevent Blindness has endorsed requiring that batting helmets have

polycarbonate face guards that meet the requirements of Standard F910 of the American Society for Testing and Materials. A copy of that Standard is attached hereto as Attachment 3.

6.

The Academy requests that the Commission initiate a rulemaking to adopt a product safety standard along the lines of the following:

> (a) This standard shall apply to all helmets sold for the intended the purpose of being worn by children under the age of 15 to protect their heads when batting while playing baseball or softball.
>
> (b) Each batting helmet shall have a face guard that complies with Standard F910 of the American Society for Testing and Materials.

The Academy stands ready to work with the Commission regarding the requested rulemaking. The Academy requests that the Commission consider and adopt the proposed consumer product safety standard.

Respectfully submitted,

Thomas W. Rhodes

Edward H. Wasmuth, Jr.

Counsel for the American Academy of Facial Plastic and Reconstructive Surgery

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AMERICAN ACADEMY OF PEDIATRICS

Risk of Injury From Baseball and Softball in Children 5 to 14 Years of Age

Committee on Sports Medicine and Fitness (RE9409)

Baseball is one of the most popular sports in the United States, with estimates of 4.8 million children 5 to 14 years of age participating annually in organized and recreational baseball and softball. Interest in and fascination with the sport have grown since the beginning of the 20th century, but it was not until 1965 that the issue of "Little League elbow" raised concern about the safety of the game. Recently, highly publicized catastrophic impact injuries from contact with a ball or bat have raised new safety concerns. These injuries provided the impetus for this review of the safety of baseball for 5- to 14-year-old participants. The discussion focuses principally on baseball, but softball is considered in accord with the availability of relevant literature. This statement mainly concerns injuries during practices and games in organized settings; players and bystanders also can be injured in casual play.

The term Little League elbow was used in 1965 to denote radiologic evidence of fragmentation of the medial epicondylar apophysis and osteochondrosis of the head of the radius and capitellum.[1,2] Subsequent studies of children 12 years old and younger[3,4] have found a substantially lower incidence of abnormalities than originally described.[1,2] Early detection and intervention seem to permit the complete resolution of symptoms and underlying structural abnormalities.[5] More serious abnormalities become more common after the age of 13 years.[6-8] The role that repetitive throwing in 5- to 14-year-old children may play in the evolution of elbow overuse injuries at an older age remains to be determined. In response to concern about Little League elbow, many youth leagues have attempted to limit the stress placed on young pitching arms. For example, Little League Baseball, Inc limits pitchers to a maximum of six innings of pitching per week and requires mandatory rest periods between pitching appearances.[9] Instruction in proper pitching mechanics is another way to prevent serious overuse throwing injuries.[5,10]

The overall incidence of injury in baseball ranges between 2% and 8% of participants per year. Most injuries are minor soft tissue trauma, usually to the face and upper extremity.[11,12] Sliding is the cause of one third of the injuries to the lower extremity. In softball and baseball, the Velcro-stabilized breakaway base significantly reduces this risk.[13,14]

Recently, concern has been raised about injuries to the eye.[15-17] Baseball seems to be the leading cause of sports-related eye injuries in children, and the highest incidence occurs in those 5 to 14 years of age. Approximately one third of baseball-related eye injuries result from being struck by a pitched ball. As a result, in this age group, the Sports Eye Safety Committee of the National Society to Prevent Blindness has recommended the use of batting helmets with polycarbonate faceguards that meet Standard F910 of the American Society for Testing and Materials.[18] These cover the lower part of the face from the tip of the nose to below the chin; they also protect against injuries to the teeth and facial bones. Functionally one-eyed athletes (those with best corrected vision in the *worst* eye of <20/50) *must* use these faceguards; they also must protect their eyes when fielding by using polycarbonate sports goggles. Eye protection also may be particularly important for young athletes who have had previous surgery or serious eye injury.

Recently the potential of catastrophic injury resulting from direct contact with a bat, baseball, or softball has received publicity. Deaths have occurred from impact to the head resulting in intracranial bleeding and from nonpenetrating blunt chest impact probably causing ventricular fibrillation or asystole.[19-21] Statistics compiled by the US Consumer Product Safety Commission[11,22,23] indicate that in the 8-year period from 1973 to 1980, 40 baseball- or softball-related deaths were reported in children 5 to 14 years of age. Of these deaths, 21 resulted from head and neck injuries, 17 from nonpenetrating impact to the chest, and 2 from other causes, an average of 5 deaths per year. In the 5-year period of 1986 through 1990, 16 baseball- or softball-related deaths were recorded, an average of 3.3 per year. Eight deaths were due to head and neck injuries, seven were caused by chest impact, and one was due to other causes. It would seem that there has been no significant recent change in impact-related deaths in baseball and softball, but conclusions must be tempered by differences in the sources for data surveillance for the two periods studied.[11,22,23]

Direct contact by the ball is the most frequent cause of death and serious injury in baseball. Children 5 to 14 years of age seem to be uniquely vulnerable to blunt chest impact, because their thoraces may be more elastic and more easily compressed.[24,25] Preventive measures to protect young players from direct ball contact include utilization of batting helmets and face protectors while at bat and on base; utilization of

This statement has been approved by the Council on Child and Adolescent Health.

The recommendations in this statement do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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the catcher's helmet, mask, and chest and neck protectors; the elimination of the on-deck circle; and the protective screening of dugouts and benches. Future equipment may include chest protectors for batters and pitchers if this equipment can be developed in an efficacious and acceptable manner. Modifications in the hardness and compressibility of softballs and baseballs have been developed for use by children of different ages, with the intent of reducing the force of impact while maintaining performance characteristics. The National Operating Committee on Standards for Athletic Equipment (NOCSAE) has developed standards for these softer baseballs.[26] Studies evaluating their playing characteristics and capacity to reduce injury are in progress; but, at the time this review was completed, it was not yet clear whether these balls offer an advantage in injury prevention.

Compared with older players, children less than 10 years of age often have less coordination, slower reaction times, a reduced ability to pitch accurately, and a greater fear of being struck by the ball. Some developmentally appropriate rule modifications are therefore advisable for this age group, including the use of an adult pitcher, a pitching machine, or a batting tee; the avoidance of head-first sliding; and perhaps the use of softer balls, if they are proven to be safer than standard ones.

There have been anecdotal reports of rare but serious cervical spine injuries occurring when a player slides head-first, hitting an opponent with the top of the helmet. This injury is similar to that caused by spearing in football. If further injury surveillance confirms the need, such sliding may need to be banned in players older than 10 years.

Much of the injury research has concerned baseball, or has not differentiated between baseball and softball. Injury risks seem to be similar in softball, except that softball players are less likely to incur overuse injuries of the pitching arm. Therefore, the same recommendations for injury prevention in baseball apply to softball, except for limitation on pitching.

RECOMMENDATIONS

The American Academy of Pediatrics recommends:

1. Pediatricians may be supportive of the desire of 5- to 14-year-old children to participate in baseball and softball. Catastrophic and chronically disabling injuries are rare and do not seem to have been increasing in frequency in the past decade. Surveillance of baseball and softball injuries should be continued.
2. All preventive measures should be employed to protect young baseball pitchers from disabling throwing injuries. These measures include a restriction on the amount of pitching, in both organized and informal settings; instruction in proper biomechanics; and education of parents, coaches, and children to permit early diagnosis and treatment of overuse pitching injuries.
3. All preventive measures that can reduce serious and catastrophic injuries should be employed in both baseball and softball. These include the use of approved batting helmets; the catcher's helmet, mask, and chest and neck protectors; and rubber spikes. The elimination of the on-deck circle, the protective fencing of dugouts and benches, and the use of breakaway bases are also recommended. Protective equipment should always be sized properly and well maintained. These preventive measures should be employed in both games and practices and in organized and informal participation. Developmentally appropriate rule modifications such as alternative pitching techniques and the avoidance of head-first sliding should be implemented for children less than 10 years of age.
4. Baseball and softball players should be encouraged to reduce the risk of eye injury by wearing polycarbonate eye protectors on their batting helmets. These should be *required* for the functionally one-eyed athlete (best corrected vision in the *worst* eye of <20/50) or for athletes with previous eye surgery or severe eye injuries, if their ophthalmologists judge them to be at increased risk of eye injury. The latter two groups should also protect their eyes when fielding by using polycarbonate sports goggles.
5. Consideration should be given to utilizing low-impact NOCSAE-approved baseballs and softballs for children 5 to 14 years of age, if these balls demonstrate satisfactory playing characteristics and reduce injury risk. Children younger than 10 years of age should be particularly encouraged to use the lowest impact NOCSAE-approved balls because these children tend to be less skilled and coordinated. A variety of studies should be undertaken to determine the efficacy of low-impact balls in reducing serious impact injuries. Research should be continued to develop other new, improved, and efficacious safety equipment.

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September, 1989

SECTION: ARTICLES

LENGTH: 2063 words

TITLE: Eye Injuries in Childhood: Demography, Etiology, and Prevention

AUTHOR: Leonard B. Nelson, MD, Thomas W. Wilson, BA, and John B. Jeffers, MD

ABSTRACT: A 1-year survey was conducted of all children with eye injuries seen in the Wills Eye Hospital emergency room to determine demographic, etiologic, and prophylactic factors. There were 810 children with ocular trauma. Childhood ocular injuries are frequent, often resulting in serious visual impairment. Many of these injuries are preventable.

[ocular injury.]

TEXT:

Ocular trauma in childhood is prevalent and may cause transient or permanent visual loss. Many of these eye injuries could be prevented, with an increased awareness and subsequent removal of the common risk factors. Recently, we reported a 3-year survey of all children requiring admission to Wills Eye Hospital because of eye injuries. [n1] The purpose of this paper is to report the frequency and causes of ocular trauma in children who were evaluated as outpatients in the Wills Eye Hospital emergency room and compare them to those children who required admission. Visual outcome and therapeutic approaches will not be discussed.

MATERIALS AND METHODS

The records of all children (15 years of age and younger) who were treated at the Wills Eye Hospital emergency room from January 1986 through December 1986 were retrospectively reviewed. The following data were recorded for every patient: age, sex, date of injury, type of injury, and cause of injury.

RESULTS

Between January 1986 and December 1986, a total of 23 584 patients were examined and treated in the Wills Eye Hospital emergency room. Children accounted for 9% (n = 2154) of this total patient population (15 years old or younger). One or more of the following ocular disorders were diagnosed: conjunctivitis, blepharitis, superficial punctate keratopathy (corneal irritation), and ocular trauma. Eye injuries accounted for 38% (n = 810) of the total child population. The data from this subpopulation were collected and analyzed.

The distributions for age and sex are illustrated in Table 1. Ocular trauma

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occurred two times more frequently in boys (n = 536) than in girls (n = 274). No age prevalence was observed.

TABLE 1. Distribution of Children With Eye Injuries (N = 810)

[SEE ORIGINAL SOURCE]

The year was divided quarterly to observe correlations between season and frequency of eye trauma. In the first quarter (January to March), 23% (n = 184) of the population of children with trauma was treated. During the second quarter (April to June), the highest prevalence of ocular trauma to children occurred, 34% (n = 273). Of the total population of children, 24% (n = 196) were treated during the third quarter (July to September). The lowest incidence of ocular trauma (20%, n = 157) occurred during the final quarter (October to December). Individual month distributions are summarized in Table 2.

TABLE 2. Month of Eye Injury

[SEE ORIGINAL SOURCE]

Ocular injuries were categorized anatomically as either extraocular, anterior globe, or posterior globe. Extraocular trauma included lid lacerations, ecchymoses, and orbital fractures. The anterior globe category was further subdivided into nonperforating and perforating injuries. Nonperforating anterior globe injuries included corneal abrasion, conjunctival foreign body, subconjunctival hemorrhage, iritis, and hyphema.

Perforating anterior globe injuries included ruptured globe, perforated cornea and conjuctival laceration. The posterior globe category included retinal edema, vitreous hemorrhage, and retinal detachment. The anterior globe (perforating and nonperforating) was the most frequent type of injury encountered (71%). Ninety-three percent of the anterior globe injuries were nonperforating injuries consisting primarily of corneal abrasions (83%). Extraocular injuries occurred in 28% of the cases, whereas posterior globe injuries occurred in only 6% of the total patient population. The results are summarized in Table 3. Because of an injury involving more than one location, 108 patients qualified for two or more of the eye trauma categories.

TABLE 3. Types of Eye Injuries

[SEE ORIGINAL SOURCE]

The causes of childhood ocular trauma varied greatly (Table 4). Only the more common causes will be discussed. The greatest percentage (12%) of children were accidentally injured by the hand or foot of another child. This category did not include those children who were intentionally punched or kicked by another child. Sport-related injuries, most commonly caused by baseball, basketball, tennis, and hockey, accounted for 10% of all ocular trauma. The specific sports in which eye injuries occurred are tabulated in Table 5. Chemicals caused ocular injury in 4% of the patients in this study. Two percent of the children were burned by a cigarette in the possession of an adult.

TABLE 4. Cause of Injury

[SEE ORIGINAL SOURCE]

TABLE 5. Sports-Related Eye Injuries
[SEE ORIGINAL SOURCE]

DISCUSSION

Childhood ocular trauma is frequent and may result in significant visual impairment. A majority of eye injuries can be eliminated with better education and improved safety precautions. Legislative changes will also help decrease the frequency of ocular trauma by restricting the availability of dangerous items, some termed "toys," to children.

The finding of pediatric ocular trauma occurring two times more frequently in boys than n girls is similar to other studies. [n1-n5] This observation is presumably due to the high physical contact and aggressive nature of play among young boys.

Careless use of common household and classroom items may often result in childhood eye injuries. Many of these objects were thrown by another child during unsupervised play. The items commonly associated with eye injuries are scissors, forks, jewelry, screwdrivers, clothes hangers, rope, pencils, and rubberbands. During the winter months, snowball-related injuries were also common.

Chemical injuries made up 4% of all ocular trauma in the pediatric population. The chemicals affecting younger children (less than 5 years old) were fingernail polish, crazy glue, household cleaners, and laundry detergents. Children obtained these harmful substances because they were not kept out of their reach. The older subpopulation (greater than 5 years old) had not worn protective goggles when handling paint products, gasoline, battery acid, or solvent used in chemistry class. Proper safety precautions would eliminate this category.

Baseball continues to be the leading cause of sports-related eye injuries seen in emergency rooms. [n6] In this study, baseball injuries made up approximately one third of the total number of eye injuries incurred while children were participating in sports; 37% of the baseball injuries occurred while the child was batting. To prevent batting-related injuries, batting helmets should be equipped with a clear protective shield to cover the eyes. In 1984, the Sports Eye Safety Committee of the National Society to Prevent Blindness recommended that baseball batters 5 to 14 years of age wear helmets with face protectors. This offers protection not only for the eyes but for the facial bones as well.

Basketball injuries were the second most common type of eye injury incurred during sports participation. Although 15% of these injuries were not the result of being struck by the ball, competitive physical contact (elbowed or poked in the eye) was the cause of the remaining eye injuries. Again, proper protective eyewear would prevent these injuries.

Children in the tennis injury category were not playing a tennis match at the time of injury. Instead, the tennis ball was thrown by another child during unsupervised play. Hockey-related injuries occurred in children participating

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in unsupervised hockey. Helmets with protective eye shields must also be used in unsupervised hockey. The widespread mandatory use of hockey face masks has prevented more than 70 000 projected eye and facial injuries int he 1 200 000 protected players, at an estimated annual savings to society of more than $10,000,000 in medical expenses. [n7]

Perforating BB gun injuries are the most serious type of eye trauma confronting children because these injuries have the worst prognosis and often result in enucleation. [n8,n9] In this study, all of the BB gun injuries occurred in boys when the BB pellet entered directly from the gun barrel or indirectly as the result of a ricochet. Only seven states currently mandate restricted use and sale of pellet-type guns to children. [n7] If the sale of BB guns were restricted by law to handgun stores and banned from toy stores, the number of children having access to these weapons would be limited.

Two percent of the total eye trauma in the pediatric population suffered cigarette burns to the cornea, conjunctiva, and eyelids. Children younger than 2 years of age were all documented victims of child abuse. Children older than 2 years of age presumably walked accidentally into a lit cigarette in the possession of an adult. However, any child with cigarette burns to the eye is a strong suspect for child abuse. A careful physical examination should be performed and an extensive social history obtained.

The patient population in this study, children seen at the Wills Eye Hospital emergency room, may better represent the type of injuries encountered in a pediatric practice. Unlike the first study, [n1] the patient population in this study includes children with minor injuries, corneal abrasions, subconjunctival hemorrhage, or chemical exposure not requiring hospital admission. The patient population in the first study only included children sustaining injuries serious enough to require admission.

When the previous study findings were compared with those from this study, the following observations were noted. The male to female ratio was 3.5:1 in the first study, with the largest number of injuries occurring in children 6 to 14 years of age, and 2:1 in in this study, with an even age distribution. Similar seasonal distributions were observed. The largest number of accidents took place during the second quarter of the year (April to June), and the smallest number occurred during the first quarter (January to March) in the first study and the fourth quarter (October to December) in the second study.

The anatomic position of the eye injuries varied between studies. In the first study, a smaller percentage of extraocular injuries were reported. Many of these injuries that are commonly seen in the emergency room do not usually require hospital admission. Injuries to the anterior globe were the most common type observed in both studies. However, a different proportion of perforating and nonperforating injuries were noted. In the previous study, a larger percentage of children presented with perforating eye injuries and, therefore, a smaller percentage had nonperforating injuries. The difference in the nonperforating-perforating distribution between studies was observed because most nonperforating injuries (ie, corneal abrasion) do not require hospital admission and, therefore, were not included in the first study.

The most common cause of eye injury in the present study was accidental injury caused by the hand or foot of another child. This category was not

included in the previous study because these injuries are usually not serious enough to require hospital admission. Sports-related injuries were common in both studies, with baseball having the highest subpopulation percentage. In part I of the study, tennis- and soccer-related injuries were more prevalent. In part II, basketball- and hockey-related injuries were more common. Chemically caused injuries, which usually do not require hospital admission, were included in part II but not part I of this study. The number of serious eye injuries is similar in both studies, but the percentage of serious eye injuries was lower in part II because it included corneal abrasions, subconjunctival hemorrhage, and chemical exposures. Cigarette burns to the eye, which frequently do not require hospital admission, were included in part II but not part I of the study.

There continues to exist a great need for education of parents, teachers, and coaches regarding the potential for eye injuries. Ophthalmologists and pediatricians must take an active role in increasing the awareness of the problem to the public and educating them about the prophylactic measures to prevent eye injuries in children.

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Standard Specification for Face Guards for Youth Baseball[1]

This standard is issued under the fixed designation F 910; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

[ε1] NOTE—Footnotes 2 and 3 were corrected in January 1993.

INTRODUCTION

In baseball, or similar sports, where the force of a pitched, hit, or deflected ball can cause facial injury, there is a need for head, facial, eye, and teeth protection. After careful consideration of the mechanisms and forces involved in this context, this specification for eye and facial protective equipment has been prepared.

The impact test is designed to approximate the impact of a direct perpendicular blow from a baseball traveling at 31 m/s (70 mph). These speeds have been confirmed by actual measurements on baseballs thrown by youth league pitchers. Performance and design requirements developed on this basis are intended to minimize injury and to prolong the useful life of the equipment. However, because of complex interactions of variables such as ball speed, direction and point of impact, and particularly, individual differences in reaction to impact forces, it must be kept in mind that some injuries, even some serious injuries, are still possible.

1. Scope

1.1 This specification covers protective face guards for sports such as youth baseball (batters and baserunners).

1.2 This type of face guard is designed to be attached to a pre-existing helmet.

1.3 The equipment covered by this specification is intended to reduce hazards of injury to the face, including eyes and mouth, due to impacts from baseballs, or other objects.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 The following precautionary caveat pertains only to the test method portion, Section 5, of this specification: *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. General Requirements

2.1 *Materials*:

2.1.1 The design of the face guards and the choice of materials shall be such as to combine mechanical strength and durability consistent with the intended use of the equipment.

2.1.2 Materials coming into contact with the wearer's face shall not be a type known to cause skin irritation or disease, and shall not undergo significant loss of strength, flexibility, or other physical change as a result of contact with perspiration, oil, or grease from the wearer's head or skin.

2.2 *Finishes*—All points shall be well finished, and free of sharp edges or other irregularities that would present potential hazards of scratching and cutting the user or an opposing player.

2.3 *Padding*—Where padded chin straps are used, the padding material shall be attached to the device in such a way as to cover all the hard surfaces that come into contact with the chin. The method of securing padding shall maintain the padding material in position under normal conditions of heat, cold, moisture, or force distortion by the wearer. Any adhesive used to attach the padding to the face guard shall be of such a type as to cause no deterioration or stress of the face guard material.

2.4 *Attachment System*—Face guards shall be attached to the helmet in such a way as to avoid reduction of the degree of protection offered by the helmet or the combination of helmet and guard. The protection offered by the helmet or guard shall be considered impaired if there is visual evidence of stress to the helmet or guard or any disengagement of the guard following the tests as set forth in 5.3 or while in use.

3. Performance Requirements

3.1 All testing shall be done with the face guard mounted on a helmet of a make or model specified by the face guard manufacturer and placed on a headform as specified in 5.1.1.

3.2 *Impact Requirements*:

3.2.1 When tested in accordance with Section 5, all face guards shall remain intact with no crazing or cracking, either in the material or at testing points.

3.2.2 No paste shall be left on the ball or on any part of the face protector as a result of the impacts as specified in 5.3.1. Paste residue will constitute a failure.

[1] This specification is under the jurisdiction of ASTM Committee F-8 on Sports Equipment and Facilities and is the direct responsibility of Subcommittee F08.53 on Headgear.

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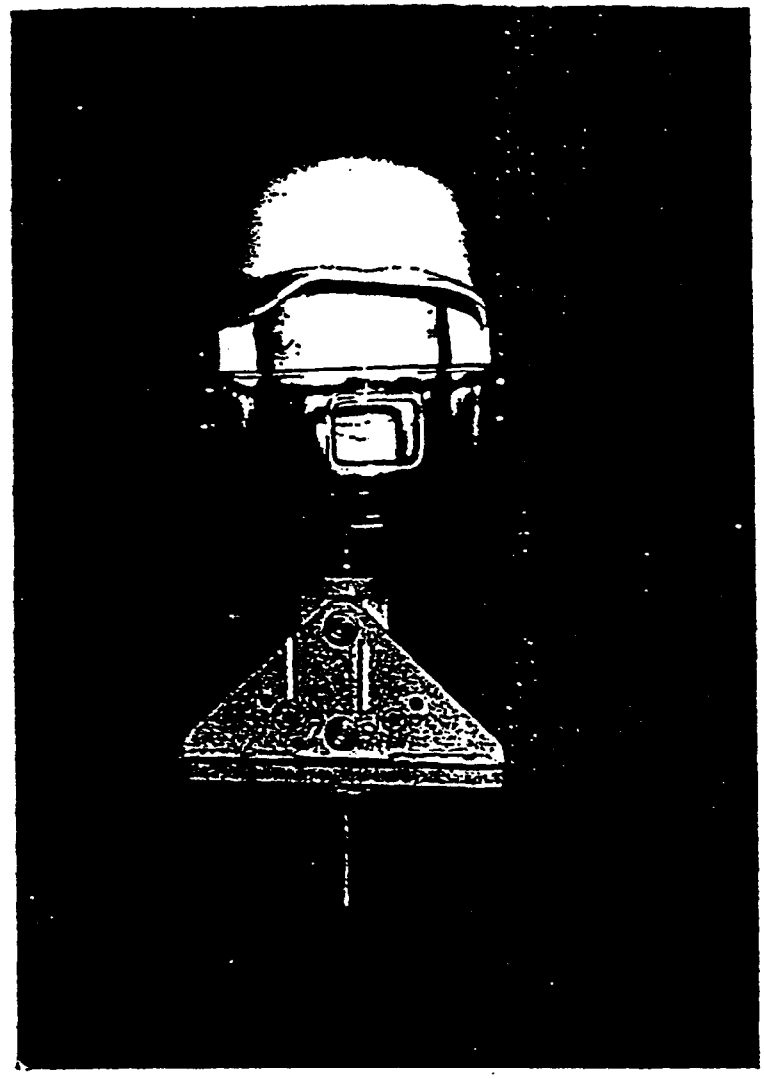

FIG. 1 Face Protector and Helmet on Headform

4. Sample Preparation

4.1 Test only face guards as offered for sale and only when attached to an appropriate helmet.

4.2 Condition face guards at the temperatures of 36 ± 2°C (97 ± 4°F) and at 10 ± 2°C (50 ± 4°F) for a minimum period of 4 h prior to test.

4.3 Assemble face guards to the helmets in accordance with instructions provided. (See 7.1.)

5. Impact Test Method

5.1 *Apparatus for Impact Tests:*

5.1.1 *Headform and Mounting*—Face guards shall be fitted on appropriate size Alderson research headform[2] (See Fig. 1) for impact tests as follows:

Fifth Percentile—Small Size (6⅝ to 6¾)
Fiftieth Percentile—Medium Size (6⅞ to 7¼)
Ninety-Fifth Percentile—Large Size (7⅜ to 7½)

Attach the headform to a heavy wire coil spring[3] (suggested size 11.1 to 12.7 mm (7/16 to ½ in.)) that is fixed to a rigid mounting offering some resistance to the force of the baseball on impact but also allowing some rebound of the headform to occur.

5.1.2 *Ball Propelling Device*—The ball propelling device shall consist of a pneumatic apparatus which has the capability of propelling a regulation baseball at velocities up to 36 m/s (80 mph). The accuracy of this device shall be such that baseballs will impact a 2.5 cm (1 in.) circular target at least 90 % of the time. (A schematic diagram of a suggested apparatus appears in Fig. 2.)

5.1.3 *Gage*, or similar device shall be included as a part of the apparatus so that the air pressure for each impact can be monitored.

5.2 *Velocity Measurement*—The velocity of the baseball shall be measured at a distance within 1 m (39.4 in.) of the impact point on the face guard when mounted on the helmet

[2] Headform available from Alderson Research Laboratories, 390 Ludlow St., Stamford, CT 06904, has been found suitable.

[3] The coil spring available from McMaster-Carr Supply Co., P.O. Box 4355, Chicago, IL 60680. Catalogue 87, cc No. 9624K61 (1981).

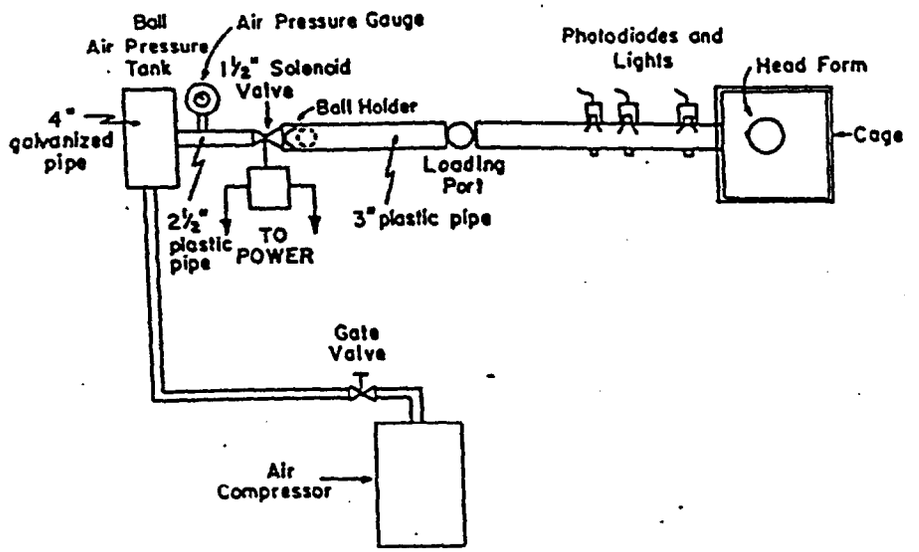

FIG. 2 Schematic of the Ball Propelling Apparatus

and headform. (Some suggested devices for measuring velocity are photocells, phototransistors, light-emitting diodes or other velocity meters with appropriate read-out devices.)

5.3 *Procedure:*

5.3.1 Each face guard to be tested shall be mounted on a baseball batting helmet according to the manufacturer's specifications. Face protectors shall be impacted two times at each of three positions: (1) directly in front with the headform and helmet in an upright (vertical) position, (2) directly in the front with the headform tilted backward away from the direction of the ball travel at an angle of 30°, and (3) with the headform and helmet in an upright (vertical) position and at a 45° angle from the direction of the impact.

5.3.1.1 Aim one of the two impacts at each of these three positions at the center of the widest opening in the face guard. Aim the other at the material structure of the face guard.

5.3.2 *Velocity*—The ball velocity for each impact in each direction shall be 30 ± 2.2 m/s (67.1 ± 4.9 mph).

5.3.3 *Verification of Ball Contact*—For verification of ball or protector contact with the face, cover the entire facial area from the frontal bone superiorly to the mandible inferiorly with Pressure Indicator Paste.[4] (See Fig. 3.) Contact of either ball or protector with any part of the face will leave paste at the point of contact. Inspect thoroughly both the ball and protector to determine if they contain residue of paste.

5.3.4 All of the impacts specified in 5.3.1 shall be made at each of the two temperatures called for in 4.2.

5.3.5 Use a different face guard for each test position at each temperature (six guards are needed for one complete test series). Each face guard will be used for two different impacts (one directed at the largest opening, and one directed at the material structure) but not for two identical impacts.

6. Precision and Bias

6.1 No statement is made about either the precision or the bias of the test method described in Section 5 since the result merely states whether there is conformance to the criteria for success specified in the procedure.

7. Product Marking

7.1 Markings should show manufacturer, date of manufacture, and brands and model names of helmets on which the guard can be used to meet the requirements of this specification.

7.2 Face guards offered for sale shall include adequate instructions for their assembly and use and a warning to users that the face guard must be discarded if, after being impacted during use, or for any other reason, it shows any signs of damage, distortion from original shape, or weakening. In addition, information shall be provided regarding any harmful effects from cleaning agents, painting agents, or antifog material.

[4] Pressure Indicator Paste (PIP) is an inert white paste used by dentists to detect pressure points under dental appliances. It is available from Mizzy, Inc., Clifton Forge, VA 24422 and has been found suitable.

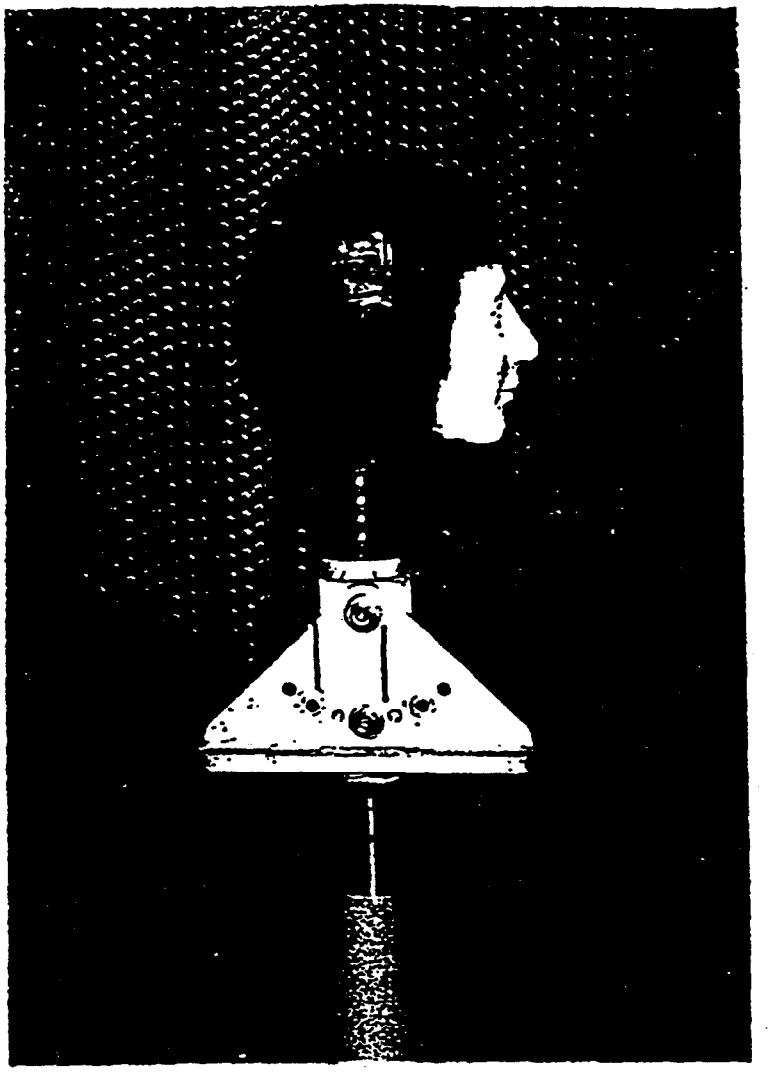

FIG. 3 Headform with Pressure Indicator Paste on Facial Area—Side View

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, PA 19103.

E

A. SPECIFIC INFORMATION ON FACE GUARDS

This section presents answers to specific questions on face guards.

1. How do facial injuries rank as a percent of all injuries for each year of age?

ANSWER

An estimated 59,400 children, ages 5 through 14, were treated in U.S. hospital emergency rooms for facial injuries associated with baseballs in 1995. About 74 percent of the victims were injured from being hit by a ball, 19 percent by a bat, and the remaining 7 percent from colliding with another player or an object. Facial injuries accounted for approximately 37 percent of the total baseball related injuries for the year. The estimated percent distribution of these injuries within each age group is presented in Table 11.

Table 11
Estimated Percent Distribution of Facial Injuries
In Children 5 to 14 Years Old,
1995

Body Area	Age									
	5	6	7	8	9	10	11	12	13	14
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Facial[1] Injury	83	59	84	51	50	39	25	25	21	31
Head/Neck Injury	11	25	5	4	4	12	8	12	6	3
Injury to[2] Other Area	6	16	11	45	46	49	67	63	73	66

[1] Included forehead, eyebrow, eye, eyeball, temple, cheekbone, fleshy part of cheek, nose, lip, teeth, tongue, chin, jaw, and ear.
[2] Included upper/lower limbs and upper/lower trunks.

Source: CPSC National Electronic Injury Surveillance System Special Baseball/Softball/Tee-Ball Survey, 1995, Directorate for Epidemiology and Health Sciences, Hazard Analysis Division.

2. Is there any particular age at which the percent of all facial injuries changes significantly?

ANSWER

A test at the 0.05 level of significance over the percent of facial injuries to children, ages 5 through 14 years, indicated a decrease at a rate of 7.0 percent per 1-year increase in child's age ($p = 0.0006$). The same test was performed for children ages 5 through 10, 5 through 11, 5 through 12 and 5 through 13 years of age. The tests indicated that there was no significant change in facial injuries to children ages 5 through 10, but there were significant changes for children ages 5-11, 5-12, and 5-13 years old. These changes indicated downward trends.

3. How are facial injuries divided between organized and unorganized play for each age year? Do the data show any natural age break for this distribution?

ANSWER

Facial injuries are divided between organized and unorganized play for each year of age as follows:

Table 12
Estimated Percent of Facial Injuries to Children 5-14 Years Old Distributed by Organized and Unorganized Play, 1995

Age	Organized Play	Unorganized Play
5	53	47
6	80	20
7	88	12
8	96	4
9	73	27
10	78	3
11	86	14
12	86	14
13	77	23
14	72	28

Source: CPSC National Electronic Injury Surveillance System Special Baseball/Softball/Tee-Ball Survey, 1995, Directorate for Epidemiology and Health Sciences, Hazard Analysis Division.

In Table 12, the facial injuries reported for children occurred most often in organized play (about 80 percent of total facial injuries). For this group, the estimated percent of facial injuries were generally high for children 6 years old and older. In contrast, facial injuries in unorganized play were generally low for children ages 7 to 12 except the 9 year olds.

4. For facial injuries in unorganized play - where did most of these injuries occur?

ANSWER

Based on available information, facial injuries in unorganized play occurred in the following places:

1. Home (26%)
2. Friend's or relative's home (21%)
3. Picnic area or camp (17%)
4. School gym class or recess (16%)
5. Neighborhood (14%)
6. Athletic field, bystanders (4%)
7. Baseball or softball field, between innings (2%)

5. For facial injuries in organized play, what position was the child playing when injured at each age year?

ANSWER

The estimated percent of total facial injuries by position and by age is presented in Table 13.

Table 13
Estimated Percent of Facial Injuries
By Position and by Age in Organized Play
Children 5 to 14 Years Old,
1995

	Age										
Position	5	6	7	8	9	10	11	12	13	14	Total
Fielder	1	0	7	8	6	5	5	6	6	5	49
Pitcher	0	0	0	2	2	<1	0	2	<1	0	7
Batter	0	0	4	<1	1	<1	3	2	0	0	11
Base-runner	0	0	0	0	0	0	1	<1	0	<1	2
Warm up/ Practice	1	5	4	7	<1	4	2	2	5	0	31
Total	2	5	15	17	9	10	11	13	12	6	100

Source: CPSC National Electronic Injury Surveillance System Special Baseball/Softball/Tee-Ball Survey, 1995, Directorate for Epidemiology and Health Sciences, Hazard Analysis Division.

6. For facial injuries to organized play batters, what percent of these injuries occurred to the side of the face towards the pitcher, versus the side of the face away from the pitcher?

For batters who were batting right handed, about 56 percent of facial injuries occurred to the left side of the face (facing towards the pitcher), 28 percent occurred to the right side of the face away from the pitcher and the remaining 16 percent of injures did not specify the exact location.

Left side

1. Left jaw (38%)
2. Left side of nose (11%)
3. Left temple (7%)

Right side

1. Right cheek bone (21%)
2. Right eyebrow (7%)

Side not specified

1. Upper lip (9%)
2. Nose (7%)

7. Do the facial injury data indicate any age break for recommending facial protection?

A comparison of all facial injuries in organized play to ball-impact facial injuries to a batter, batting right handed is presented below. The data show that in contrast to facial injuries, ball-impact injuries were concentrated for batters between the ages of 7 and 12.

Facial Injury	
5 year olds	2%
6 year olds	5%
7 year olds	15%
8 year olds	17%
9 year olds	9%
10 year olds	10%
11 year olds	11%
12 year olds	13%
13 year olds	12%
14 year olds	6%

Facial Injury to Batter	
5 year olds	0%
6 year olds	0%
7 year olds	36%
8 year olds	4%
9 year olds	12%
10 year olds	20%
11 year olds	7%
12 year olds	21%
13 year olds	0%
14 year olds	0%

8. What percent of batters were wearing a batting helmet?
What percent of batters were wearing a face guard?
What percent of baserunners were wearing a batting helmet?
What percent of baserunners were wearing a face guard?

Almost all (99%) of the batters were wearing a batting helmet in organized play. However, only 16 percent of these batters were wearing a helmet with a face guard. The percent distribution of a batter wearing a face guard, by age, is presented below:

5 year olds 0%
6 year olds 0%
7 year olds 0%
8 year olds 0%
9 year olds 6%
10 year olds 46%
11 year olds 14%
12 year olds 13%
13 year olds 21%
14 year olds 0%

There was no information from this study on protective equipment for baserunners.

9. How do the location and severity of injury compare for batters wearing face guards versus those not wearing face guards?

How do the location and severity of injury compare for baserunner wearing face guards versus those not wearing face guards?

Location and severity of the injuries for batters wearing a face guard versus those not wearing a face guard in organized play are presented in Tables 14-14a. As shown, wearing a face guard appeared to lessen the percent of face area injuries and the percent of fractures (a more severe injuries).

Table 14
Location of Injuries for Batters
In Organized Play
Children 5 to 14 Years Old,
1995

Location	Wearing Face Guard (%)	Not Wearing Face Guard (%)
Total	100	100
Face Area	0	26
Head/Neck Area	0	4
Other[1]	100	70

[1] Including upper/lower limbs and upper/lower trunks.

Source: CPSC National Electronic Injury Surveillance System Special Baseball/Softball/Tee-Ball Survey, 1995, Directorate for Epidemiology and Health Sciences, Hazard Analysis Division.

Table 14a
Diagnosis of Injuries for Batters
In Organized Play
Children 5 to 14 Years Old,
1995

Diagnosis	Wearing Face Guard[1] (%)	Not Wearing Face[2] Guard (%)
Contusions/abrasions	10	90
Fractures	39	61
Strains/Sprains	0	100
Lacerations	0	100
Concussions	0	100
Hematomas	64	36

[1] There were no facial injuries for this category; these diagnoses were for injuries to other body parts.
[2] These diagnoses included facial injuries.

Source: CPSC National Electronic Injury Surveillance System Special Baseball/Softball/Tee-Ball Survey, 1995, Directorate for Epidemiology and Health Sciences, Hazard Analysis Division.

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July 26, 1995

Susan B. Kyle, Ph.D.
Project Manager
Directorate for Engineering Services
U.S. Consumer Product Safety Commission
4330 East-West Highway, Room 702-05
Bethesda, Maryland 20814

Re: HP95-1
Petition to Require Face
Guards on Youth Batting Helmets

Dear Sue:

On behalf of Dr. Robert Crow, we are submitting the enclosed paper entitled "Facial Protection in Baseball" to be included in the record in the above-referenced matter.

Please do not hesitate to contact me with any questions you may have.

Sincerely yours,

Diane Zipursky

Diane Zipursky

Enclosures

cc: Robert W. Crow, M.D.

Facial Protection in Baseball

Robert W. Crow, M.D.

Facial protection in baseball has become an issue of increasing concern. Injuries to the head and face have been estimated at 25-36% of all injuries incurred while participating in this sport. The majority of these injuries are contusions (bruises) and abrasions but a few have been severe with resultant deformity and injury to the eye, as well as, facial bone fractures, including the zygoma, orbital rims, mandible and teeth. Players of all ages including young athletes, college and professionals have experienced these kinds of injuries.

The Consumer Product Safety Commission (CPSC) has received a petition (HP95-1) asking them to consider mandatory use of full face protection in youth baseball in an effort to hopefully reduce this incidence. This petition was initially greeted with enthusiasm by many people but as it was examined more closely some concerns became apparent. The major criteria set to evaluate the facial protection to be employed was a standard established by the American Society for Testing Materials (ASTM) in 1986. The standard was based only on the ability of a face guard to withstand an impact from a thrown baseball. It did not include evaluation of other factors of concern to many people, including the author. Two of the factors not addressed relate to visual interference with use of this equipment and ability to gain access to the airway in cases of neck or throat injury with the guards in place. For this reason the author felt it appropriate to examine these issues more closely.

Visual fields utilizing the Goldmann Visual Field Instrument were obtained. Representative results are shown in Figures 1-5. Figure 1 marked Control shows a visual field obtained with a batting helmet with no face guard attached. The field of vision is essentially normal except for the superior area, which is decreased because of the bill of the cap. (normal field superiorly is 50 degrees). The black circle on the diagram is called "the blind spot". This represents the optic nerve, an area where there are no photoreceptors and, therefore, no vision. This is a normal finding in most people. This "control" was used as the standard for comparison with the facial protectors attached to helmets as shown in Figures 2-5.

Figure 2 shows the field of vision obtained with the C-Flap facial protector. The field shows only a small restriction in the inferior field (approximately 10 degrees); otherwise, it is identical to the control field. Figure 3 shows the field of vision with the Home Safe face guard. There is a 10 degree reduction in the visual field on the nasal side (right side) but, most important, there is a 30 degree reduction in the inferior field. The larger dark area, in addition to the previously described blind spot, is called a scotoma and is an additional area of absolute visual absence, further compromising the visual field. Figure 4 is a visual field with a wire guard, made by both Schutt and Riddell Companies. In this study, there is a reduction on the nasal side of 20 degrees and a 30 degree reduction in the inferior field. The larger dark area is an additional area of absent vision. Finally, Figure 5 is a visual field with the StarBar face guard. The inferior field of vision in this case is almost totally blocked with the largest scotoma noted. These tests clearly show that the full face guards examined show significant visual field impairment, especially in the inferior poles of vision. This is the area that is most needed to evaluate a pitched ball.

Airway accessibility was the other issue of concern. In cases of trauma to the neck and throat it is often necessary to clear the oral cavity of blood and debris and insert an airway. In this type of injury, it is usual to leave the protective helmet in place until it is established that removing it will not further complicate a potential neck injury. If a face guard cannot be removed and one cannot gain access to the mouth of an injured athlete a potential fatality can result. Demonstration of this problem is shown in the photos depicted in Figures 6-8.

These findings demonstrate that the full face guards currently available do cause significant visual interference and do not permit adequate access to airway. Baseball is a sport, and when parents allow their children to participate, they do so with the recognition that there is a potential for injury. While development of equipment to reduce the likelihood of injury is important, government mandating use of specific equipment is inappropriate, particularly where such equipment does not fully address the problem.

Mandatory use of full face guards at this time is, in the author's opinion, a liability rather than a benefit and it is his hope that the Consumer Product Safety Commission will reject the proposal before them.

The author wishes to thank Mrs. Randi Karsch, Thomas Harbin Jr., M.D. and Elliot Levine, M.D. of Eye Consultants of Atlanta, P.C. and Mr. Michael D. Wasney of Humphrey Instruments for their help in obtaining and interpreting the visual fields used in this article.

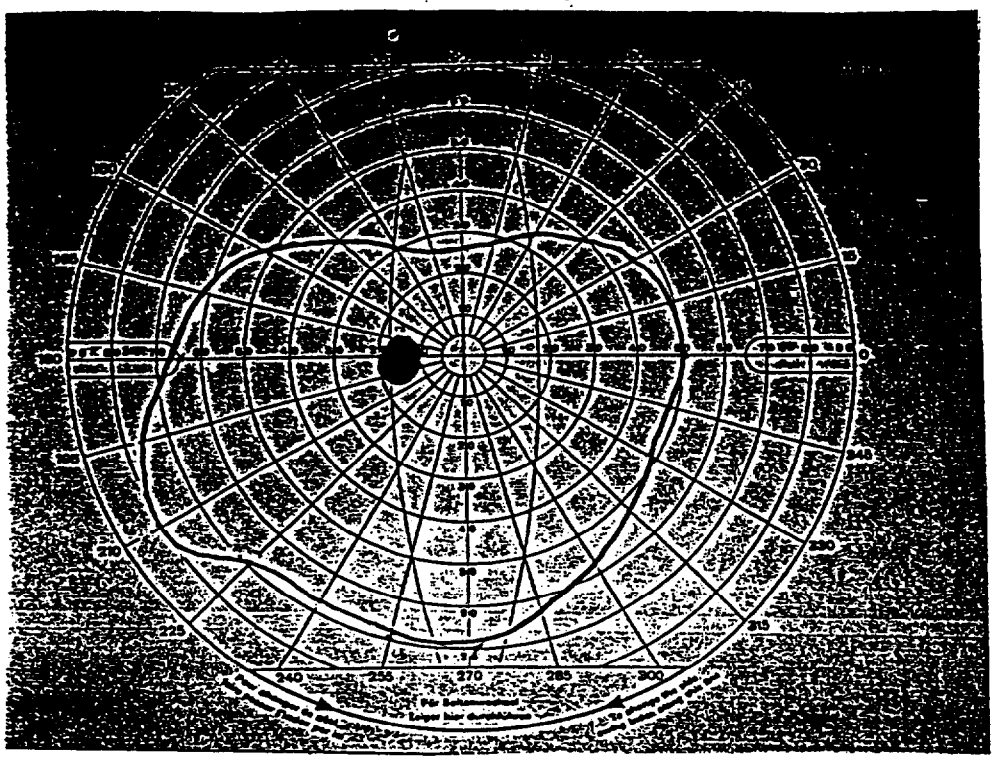

FIGURE 1. HELMET WITHOUT FACEGUARD SHOWING WIDE FIELD OF VISION

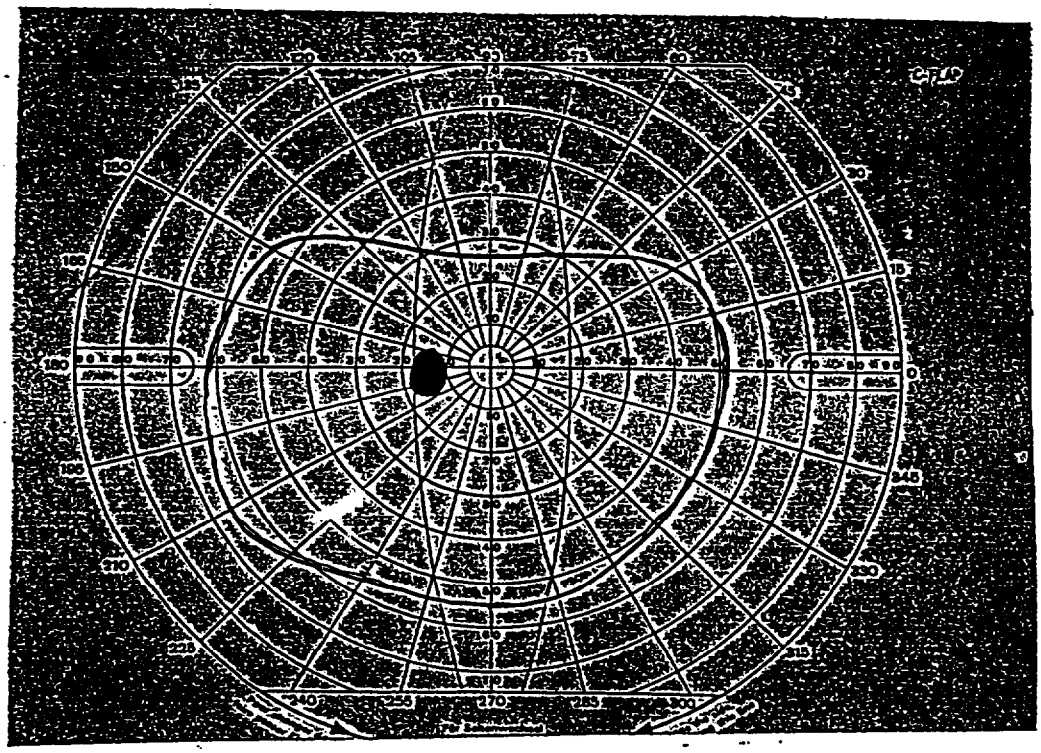

FIGURE 2. HELMET WITH C-FLAP FACEGUARD SHOWING WIDE FIELD OF VISION

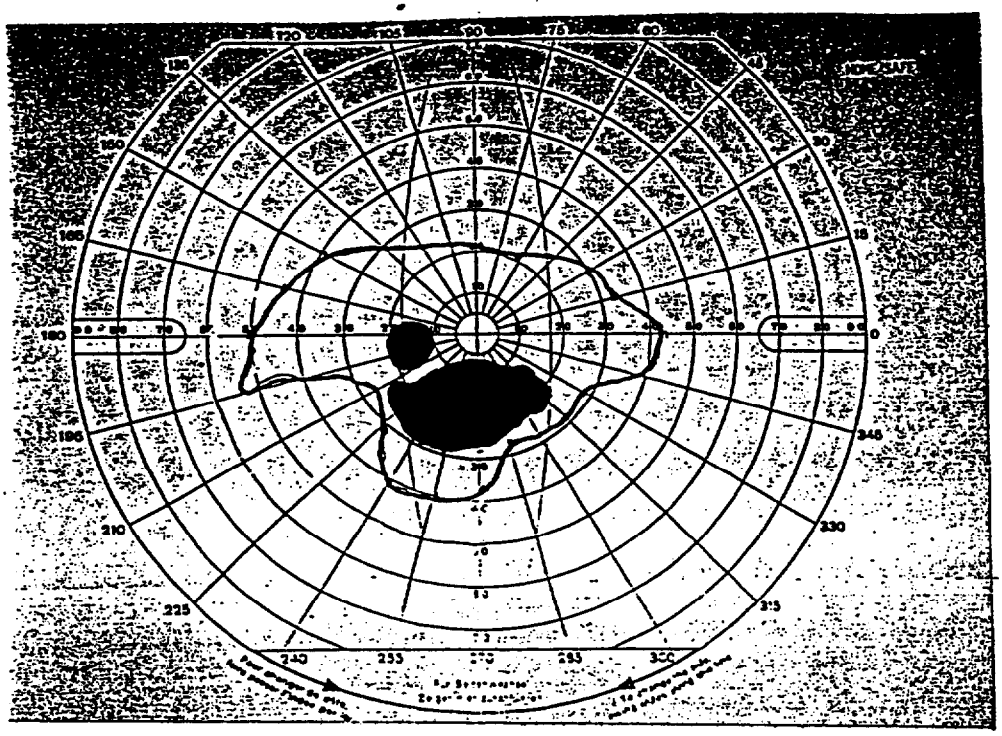

FIGURE 3. HELMET WITH HOME-SAFE FACEGUARD SHOWING COMPROMISED FIELD OF VISION

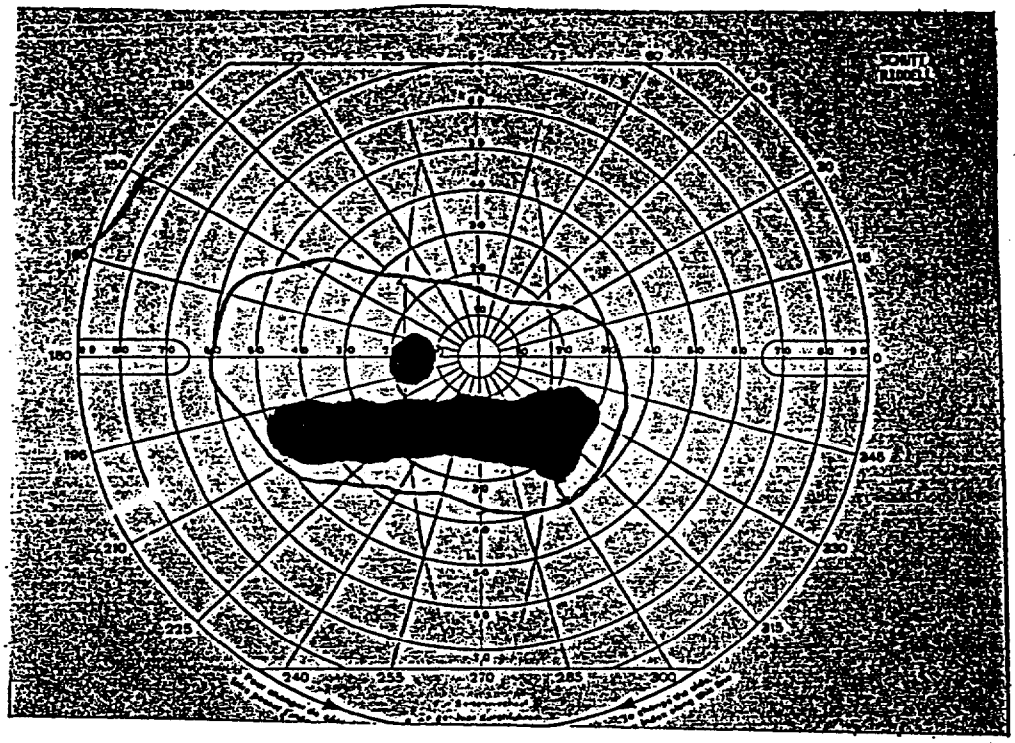

FIGURE 4. HELMET WITH SCHUTT FACEGUARD SHOWING COMPROMISED FIELD OF VISION

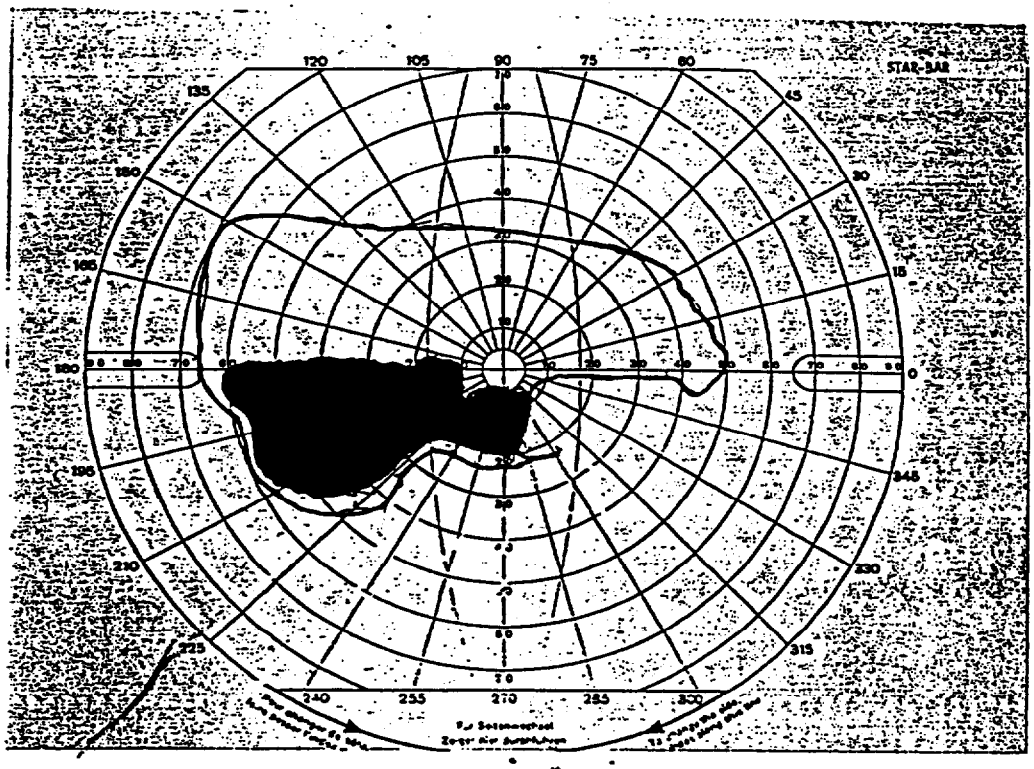

FIGURE 5. HELMET WITH STARBAR FACEGUARD SHOWING COMPROMISED FIELD OF VISION

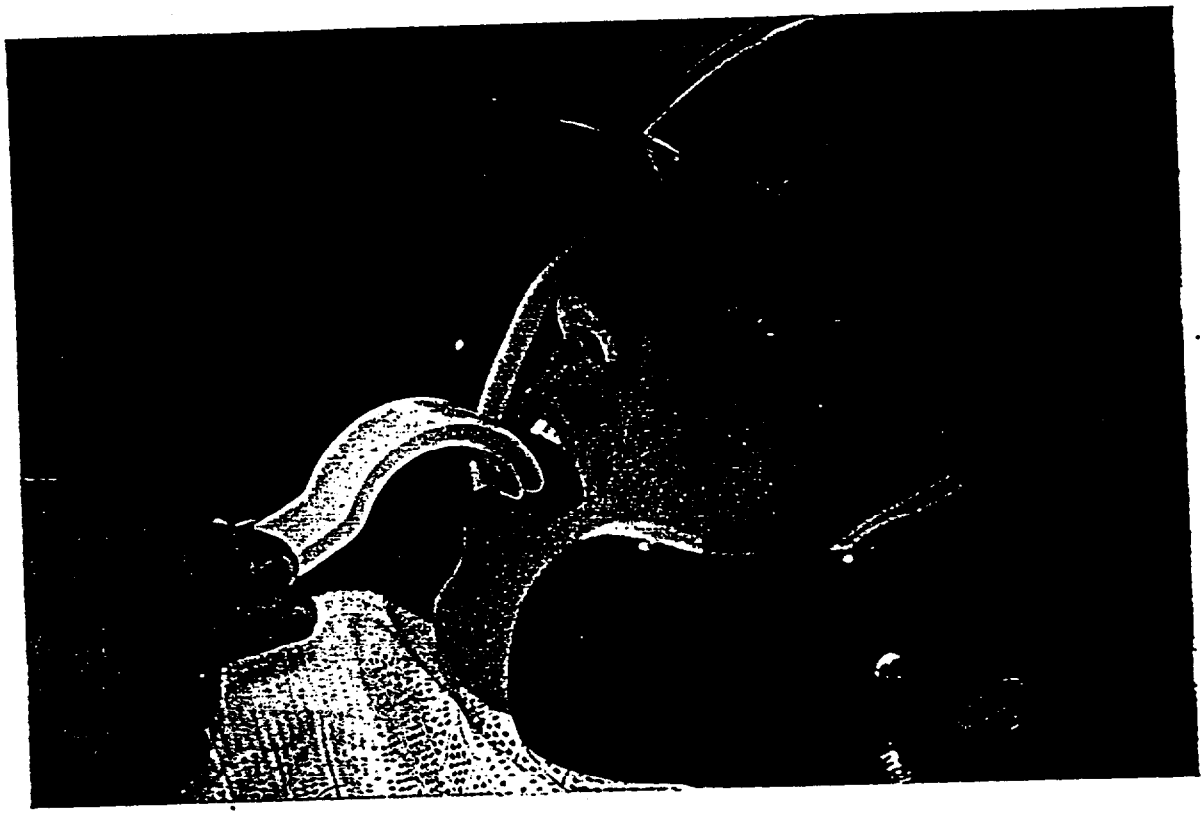

FIGURE 6. HELMET WITH C-FLAP SHOWING EASY ACCESS TO AIRWAY

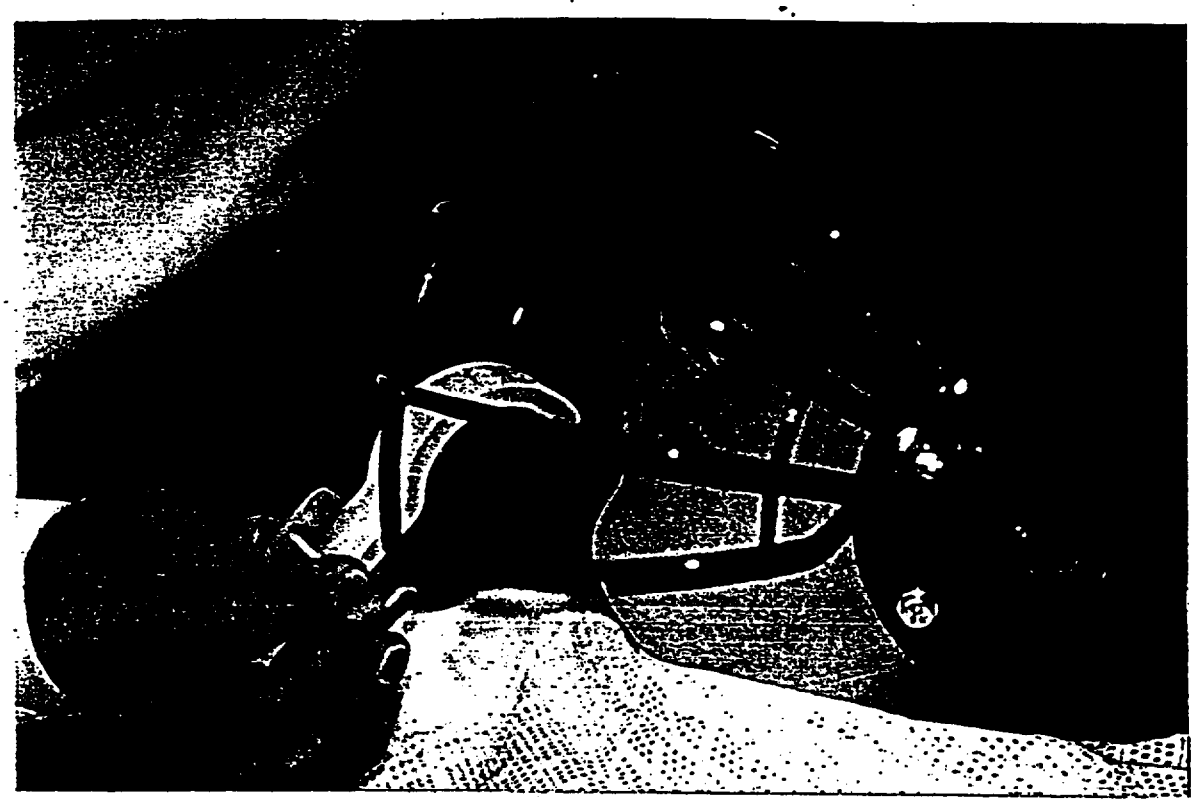

FIGURE 7. HELMET WITH RIDELL FACEGUARD SHOWING LIMITED ACCESS TO AIRWAY

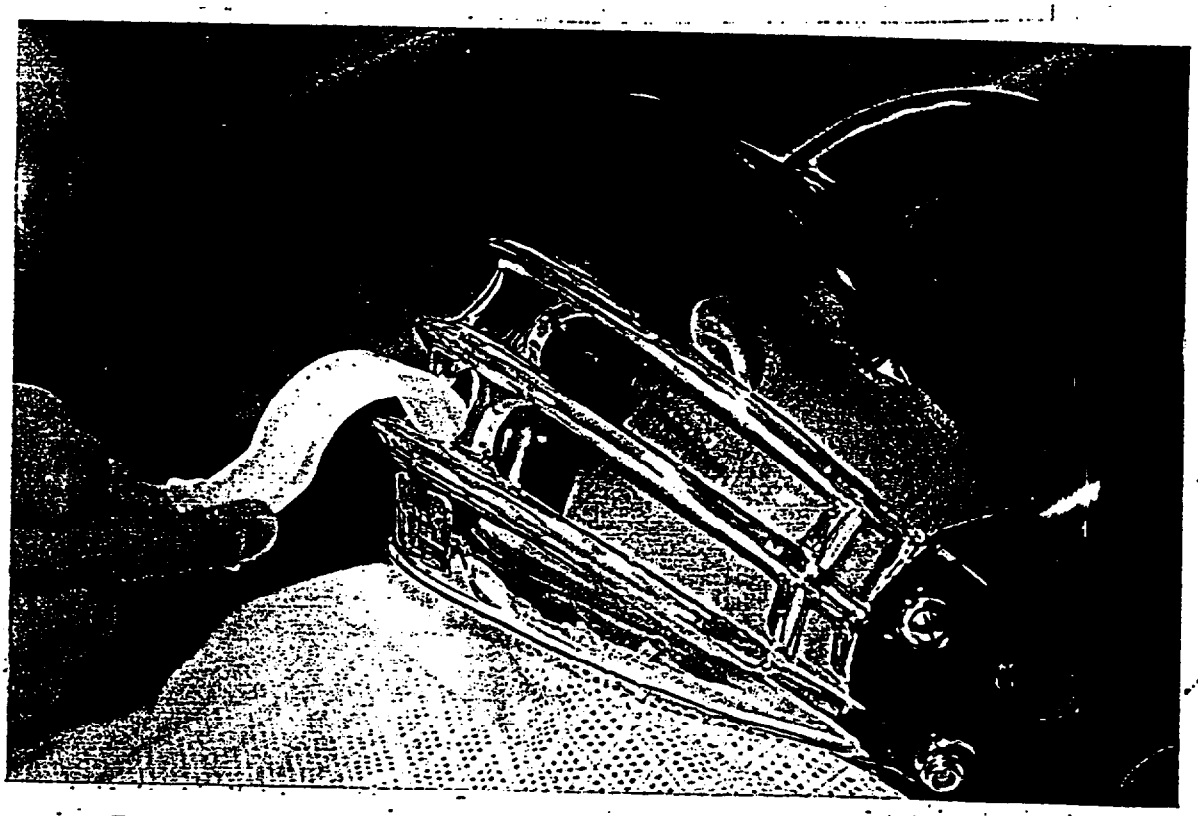

FIGURE 8. HELMET WITH STARBAR SHOWING NO ACCESS TO AIRWAY

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April 17, 1996

VIA HAND-DELIVERY

Ms. Susan Kyle
U.S. Consumer Product Safety
Commission
4330 East-West Highway
Bethesda, Maryland 20814

Dear Ms. Kyle:

We are writing on behalf of Dr. Robert W. Crow and C-Flap, Inc. to submit new data indicating that the Commission and Staff would be doing the public a disservice by granting the petition filed by the American Academy of Facial Plastic Surgeons that could result in mandating full face guards or bars for baseball helmets for youth under 15. Put simply, the data demonstrate that if required to use these devices, children or others would be in danger of impaired ability to perceive and react to a baseball being thrown at the batter because of visual distortion.[1]

At the outset, we want to reiterate that Dr. Crow fully supports the use of appropriate safety equipment to avoid sports injuries. We also support the Commission in making information available to the public for use by parents, schools, athletic directors and others in choosing the type of equipment they feel is most appropriate for the children in their care.

However, we have serious reservations about the government's actually requiring a specific form of facial protection in the absence of compelling data demonstrating that only that form provides adequate protection. And where, as here, the data show the opposite -- i.e., that the specific form requested in the petition

[1] As we have previously indicated, these devices can also lead to the obstruction of airway accessibility. This is of particular concern where there is an injury to the neck or throat, and the oral cavity must be cleared of blood and debris.

presents serious disadvantages -- the Commission should not initiate any action whose effect would be to take the choice of equipment away from parents and athletic directors and, instead, mandating through government fiat the use of that specific form of equipment.[2] Similarly, the issuance of a report by the Commission Staff that does not fully and accurately reflect the data would be inappropriate, contrary to the goals everyone shares of increasing safety, and unlawful.

The enclosed data consist of studies performed by Dr. R. Doyle Stulting, Professor of Ophthalmology and Director of Cornea Service at Emory University School of Medicine. Dr. Stulting performed multiple visual field tests with helmets with attached StarBar, HomeSafe, Schutt, Riddell and C-Flap faceguards.

The tests were performed in a standard Goldmann Visual Field Perimeter. The subject places his face into the machine and sees what looks like a sphere with a small light. The tester is on the opposite side of the machine and moves the light around the sphere. When the subject sees the light, he or she presses a button. The subject's response is reflected in the charts attached to Dr. Stulting's report. For example, referring to the attached chart for the test with the HomeSafe faceguard, the space within the two "ovals" is the part of the field that the subject saw. The space outside the "ovals" as well as the dark blotches within the two ovals are obstructed areas that the subject did not see. Each of the other charts depicts the vision with one of the respective subject faceguards.

The first chart shows the "normal" vision with helmet in place but no faceguard attached. Even a cursory review of the charts shows that the C-Flap retains more of the normal field of vision than any of the other faceguards. Dr. Stulting's report describes the specific data. For your information, we have also appended a sheet defining some of the terms used by Dr. Stulting in his report.

The differences found by Dr. Stulting are significant. This is the field that a batter sees. Dr. Stulting concludes that with the HomeSafe, StarBar, Schutt and Ridell protectors, " . . . the ability to perceive and react to a moving subject that is presented in this area of the visual field, would be impaired even if the object is presented in the

---

[2] In any event, the law states a preference that the Commission adopt "performance" rather than "design" standards. Obviously, a so-called "performance standard" with provisions so narrow as to, in effect, require certain forms of equipment does not fulfill this requirement.

area that was not defined as a scotoma. I believe that any fast moving, small, low contrast subject [e.g., a baseball] would be subjected to such visual distortion in this area and that an athlete may not be able to perceive it or react to it appropriately."

On the basis of these data and conclusions, we urge the Staff and the Commission to tread very cautiously in this area. Forms of equipment that appear attractive on their face may not withstand the scrutiny that the public health and law require of the Commission. In this regard, while the Staff appropriately works with outside standard setting organizations, it is with the Staff and the Commission -- and not with these organizations -- that, in the end, responsibility lies for analyzing carefully the data and making the public policy judgments inherent in any mandatory governmental action. Put simply, we respectfully submit that the data require the Commission and Staff to exercise its own judgment to deny the Petition.

Sincerely yours,

Andrew S. Krulwich
Counsel to C-Flap, Inc.

ASK/mlp

cc: Chairman Ann Brown
Commissioner Mary Sheila Gall
Commissioner Thomas Moore

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At the request of Robert W. Crow, M.D., multiple visual fields were performed with the test subject wearing helmets with attached StarBar, HomeSafe, Schutt, Riddell and C-Flap faceguards. The test subject was a 47-year-old white male Ophthalmologist with no visual abnormalities other than a mild, insignificant refractive error. The individual performing the test was a trained, experienced ophthalmolic technician who was unaware of the type of visual field that would be obtained.

Tests were performed on a standard Goldmann Visual Field Perimeter using the II4e test object. The subject positioned his head in the visual field machine after the restraining bar had been removed. The central fixation point was placed approximately midway between the bill of the helmet and the visual obstruction below with the StarBar, HomeSafe, Schutt and Riddell faceguards. For the C-Flap, the head was positioned so that the bill approximated the position of the bill with the other helmets.

The visual fields that were obtained are attached. The normal visual field using the helmet without a face guard shows visibility of the II4e test object to 50-55 degrees nasally and approximately 80 degrees temporally and inferotemporally. The field is truncated at 20 degrees superiorly.

With the C-Flap guard, the visual field is also restricted at approximately 20 degrees superiorly. There is also a mild restriction inferotemporally of approximately 10 degrees.

With the HomeSafe guard, there is a horizontal scotoma measuring approximately 8-12 degrees in width, the top of which is located at approximately 18 degrees below fixation. There is also another C shaped scotoma inferionasally.

With the StarBar guard, there are two horizontal scotomata, the most superior of which begins 12 degrees below the fixation point and ends approximately 18 degrees below the fixation point. The second one begins about 32 degrees below the fixation point and ends about 42 degrees below the fixation point.

With the Schutt and Riddell guards, there are absolute scotoma corresponding to the horizontal and vertical bars. The superior one is centered at about 10 degrees below the fixation point and the middle one is centered at about 47 degrees below the fixation point. The inferior bar is below the normal visual field as determined by the II4e isopter.

THE ROBERT W. WOODRUFF HEALTH SCIENCES CENTER

I have also reviewed the findings of Paul Vinger, M.D., documented in a letter dated January 2, 1996. I agree with his conclusion that none of the flaps cause visual obstruction within the central vertically measured 30 degrees of visual field. I disagree, however, with his conclusion that significant scotomas can not be plotted with the HomeSafe or StarBar flaps.

It is also important to note with these face guards that the C-Flap allows the wearer to position his face in such a way that the test object is centered between the absolute scotoma created by the bill of the helmet and the absolute scotoma created by the C-Flap itself. If this is the case, the observer obtains an obstruction-free field of view that amounts to about 80 degrees.

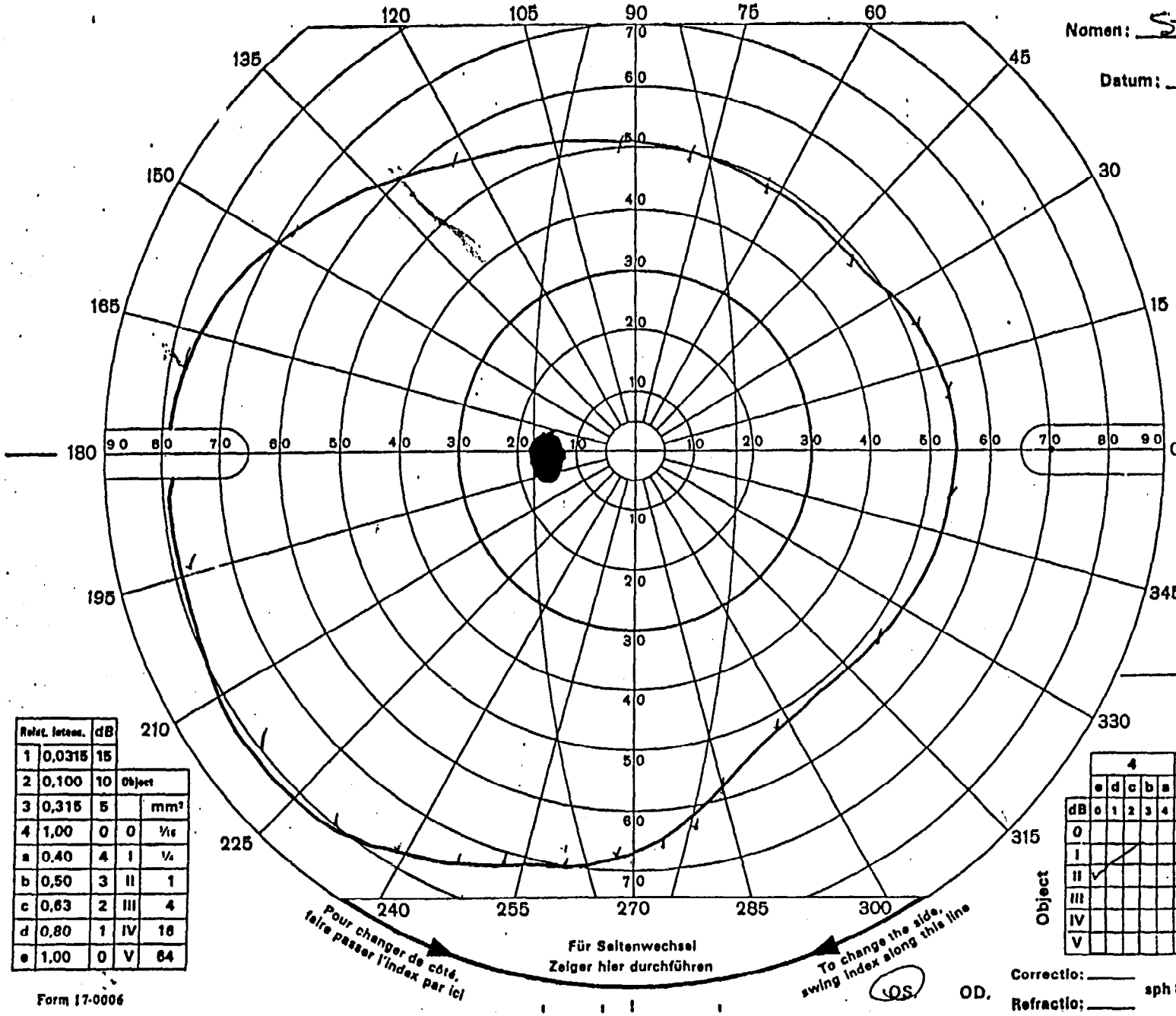
In contrast, the other four guards restrict the unobstructed visual field to 28-38 degrees vertically. If one positions the object of regard in the center of this unobstructed area of vision, the absolute scotoma created by the bill of the helmet falls at approximately 14-19 degrees superiorly.

As the observer in the above test, it was clear to me that the visual image of the test target was distorted with the HomeSafe, StarBar, Schutt and Riddell flaps whenever the test object fell in the area of the protector (more than 12-18 degrees below the fixation point). I believe that the ability to perceive and react to a moving object that is presented in this area of the visual field, would be impaired even if the object is presented in the area that was not defined as a scotoma. I feel that any fast moving, small, low contrast object would be subjected to such visual distortion in this area and that an athlete may not be able to perceive it or react to it appropriately.

Nomen: STUTTING

Datum: 1/18/96

Normal



Relat. Intens.		dB		
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2	0,100	10	Object	
3	0,315	5		mm²
4	1,00	0	0	1/16
a	0,40	4	I	1/4
b	0,50	3	II	1
c	0,63	2	III	4
d	0,80	1	IV	16
e	1,00	0	V	64

Form 17-0006

_____ mm Diameter pupilla

Relat. Intens.

	4					3					2					1			
	e	d	c	b	a	e	d	c	b	a	e	d	c	b	a	e	d	c	b
dB	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0																			
I																			
II	✓																		
III																			
IV																			
V																			

Object

Correctio: _____ sph ○ _____ cyl _____ • Vi

Refractio: _____ _____ _____ • _____

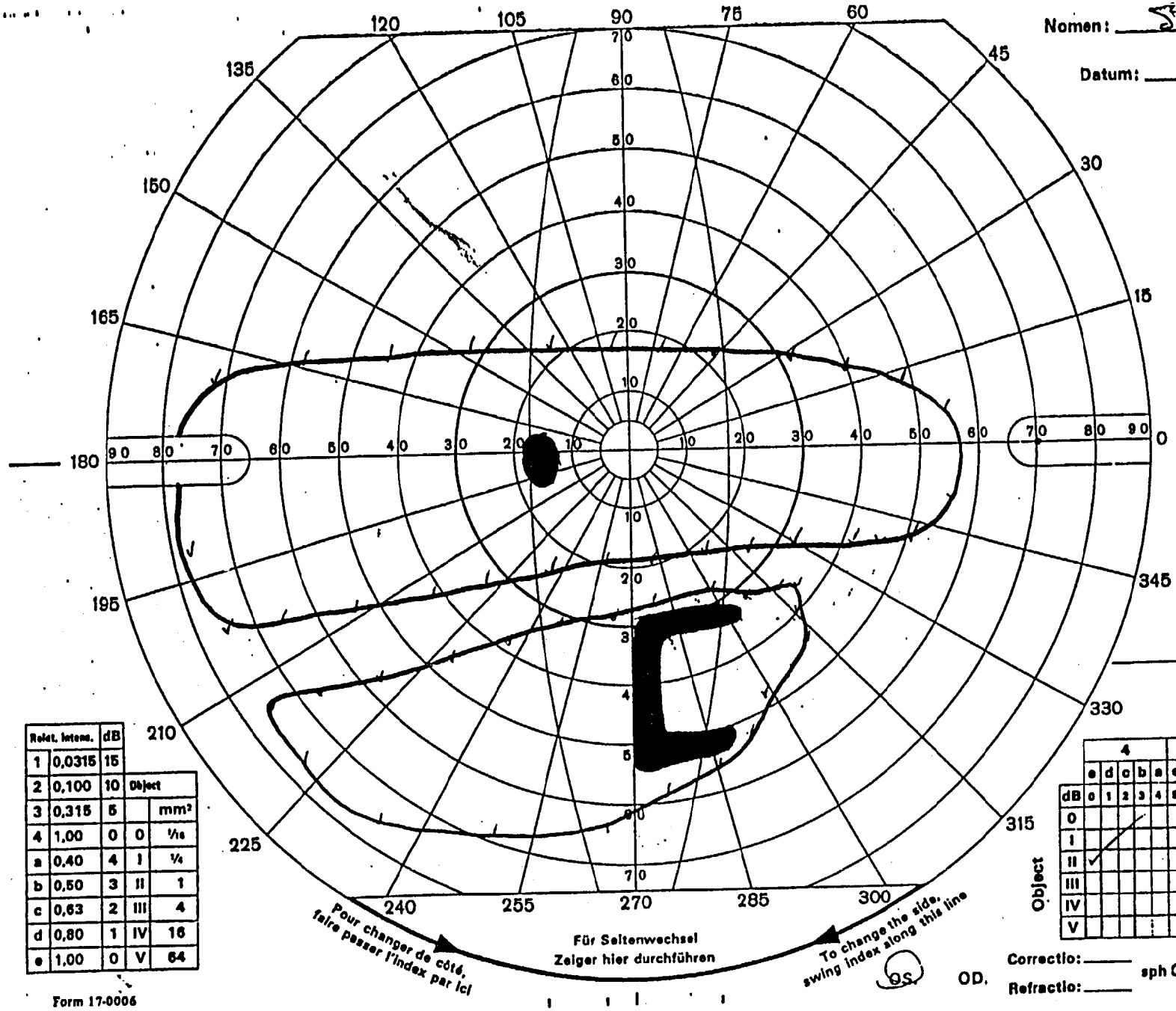
OS. OD.

48

Nomen: STULTING

Datum: 1/18/96

Home Safe



Relat. Intens.		dB		
1	0,0315	15		
2	0,100	10	Object	
3	0,315	5		mm²
4	1,00	0	0	1/16
a	0,40	4	I	1/4
b	0,50	3	II	1
c	0,63	2	III	4
d	0,80	1	IV	16
e	1,00	0	V	64

Form 17-0006

_____ mm Diameter pupilla

Relat. Intens.

	4					3					2					1			
	e	d	c	b	a	e	d	c	b	a	e	d	c	b	a	e	d	c	b
dB	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0																			
I																			
II	✓																		
III																			
IV																			
V																			

Object

Correctio: _____ sph C _____ cyl _____ Vi

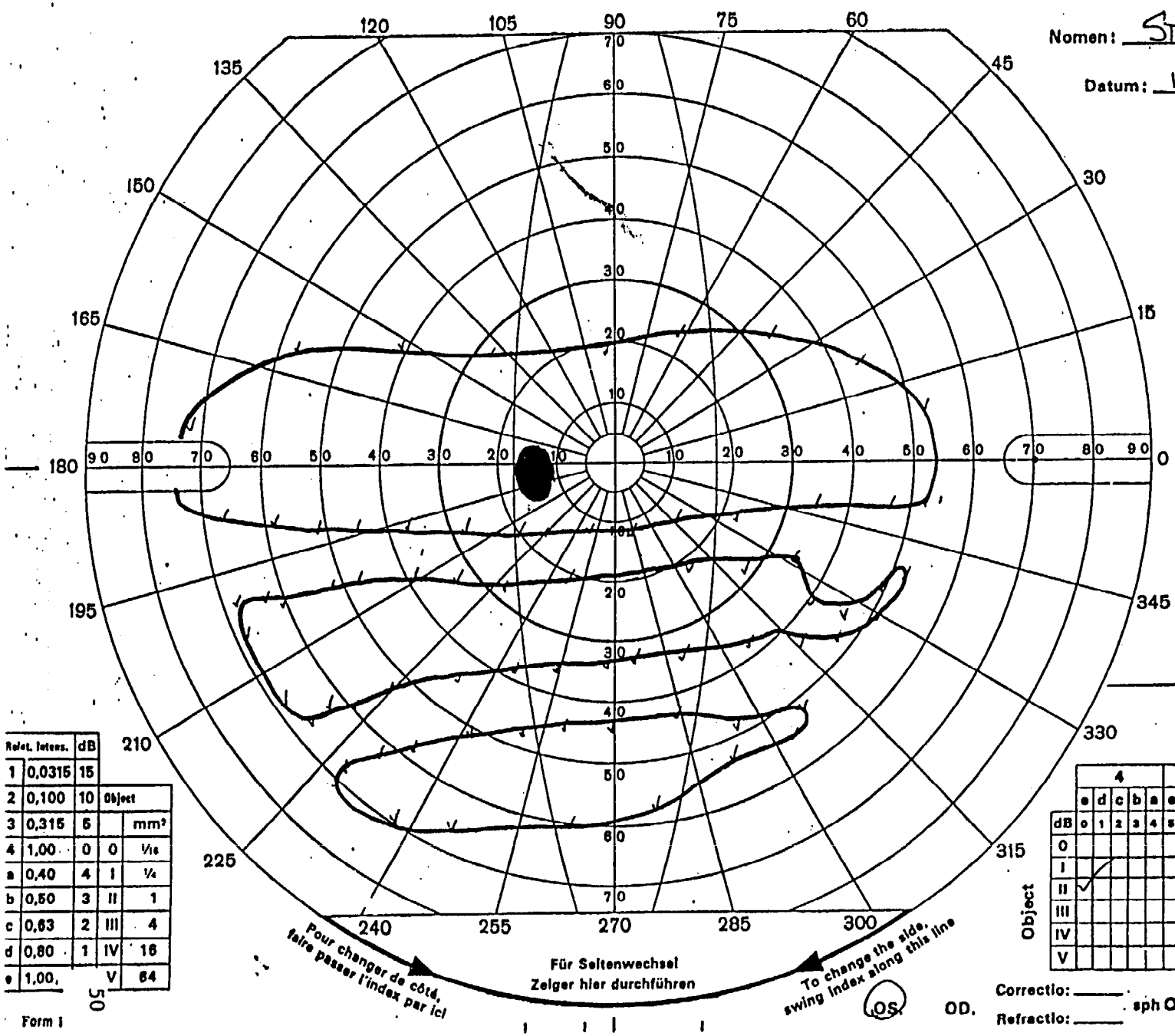
Refractio: _____

OS. OD.

Nomen: STULTING

Datum: 1/18/96

Star Box



	Relat. Intens.	dB	Object	
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2	0,100	10		
3	0,315	5		mm²
4	1,00	0	0	1/16
a	0,40	4	I	1/4
b	0,50	3	II	1
c	0,63	2	III	4
d	0,80	1	IV	16
e	1,00		V	64

Form I

50

_____ mm Diameter pupillae

Relat. Intens.

Object	4					3					2					1				
	e	d	c	b	a	e	d	c	b	a	e	d	c	b	a	e	d	c	b	a
dB	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0																				
I		✓																		
II	✓																			
III																				
IV																				
V																				

Correctio: _____ sph ○ _____ cyl _____ ° Visus:

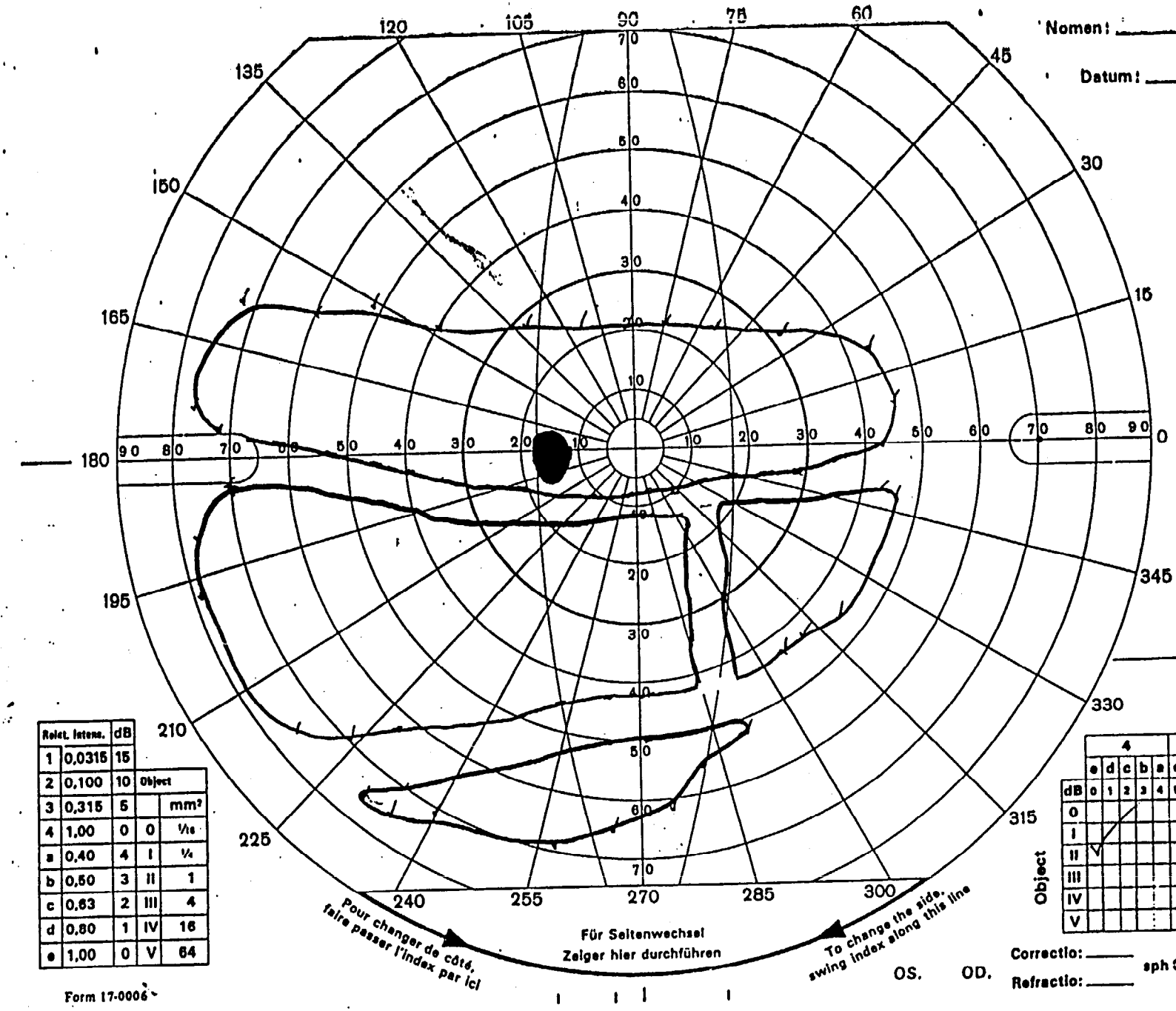
Refractio: _____ _____ _____ ° _____

OS OD.

Nomen: _____

Datum: _____

Shutt
Riddell



Relat. Intens.		dB		
1	0,0315	15		
2	0,100	10	Object	
3	0,315	5		mm²
4	1,00	0	0	1/16
a	0,40	4	I	1/4
b	0,50	3	II	1
c	0,63	2	III	4
d	0,80	1	IV	16
e	1,00	0	V	64

Form 17-0006

_____ mm Diameter pupillae

Relat. Intens.

	4					3					2					1				
	e	d	c	b	a	e	d	c	b	a	e	d	c	b	a	e	d	c	b	a
dB	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0																				
I																				
II																				
III																				
IV																				
V																				

Object

Correctio: _____ sph ○ _____ cyl _____ • Visu

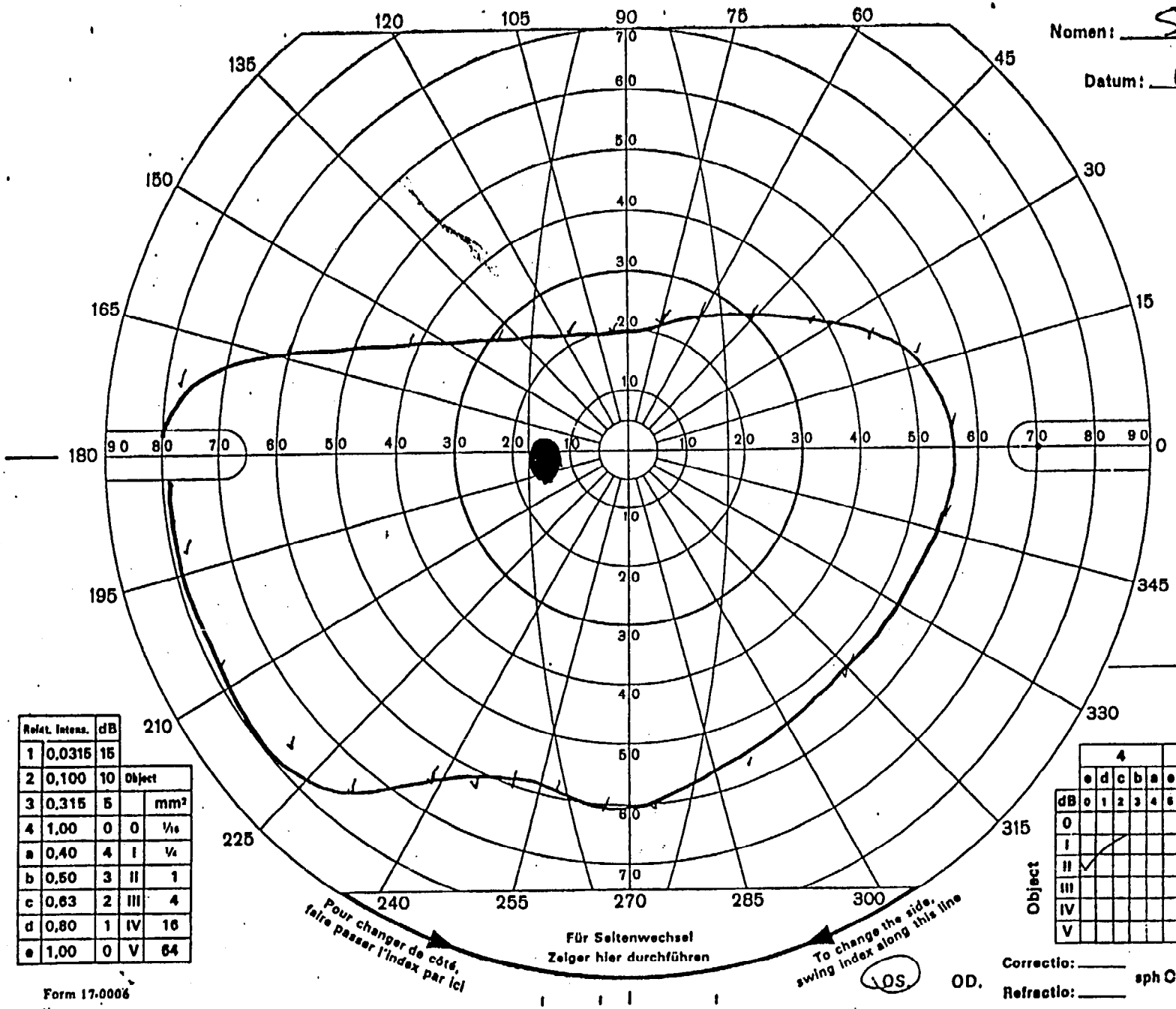
Refractio: _____ _____ _____ • _____

OS. OD.

Nomen: STULTING

Datum: 1/18/96

C-Flap



Relat. Intens.		dB		
1	0,0315	15		
2	0,100	10	Object	
3	0,315	5		mm²
4	1,00	0	0	1/16
a	0,40	4	I	1/4
b	0,50	3	II	1
c	0,63	2	III	4
d	0,80	1	IV	16
e	1,00	0	V	64

Form 17-0006

_____ mm Diameter pupillae

Relat. Intens.

	4				3				2				1			
	e	d	c	b	a	e	d	c	b	a	e	d	c	b	a	e
dB	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0																
I																
II	✓															
III																
IV																
V																

Object

Correctio: _____ sph C _____ cyl _____ • Visu

Refractio: _____ _____ _____ • _____

OS. OD.

DEFINITIONS OF TERMS

Nasally -- towards the nose

Temporally -- measurements toward outside of the head

inferotemporally -- looking down and out

superiorly -- up, above

scotoma -- area of absolute visual obstruction -- no light acuity

scotoma infernasally -- no object seen in area

New England Eye Center • Tufts University School of Medicine

Vision Performance and Safety Service

PAUL F. VINGER, M.D., *Director*
Associate Clinical Professor of Ophthalmology

January 29, 1996

Sue Kyle
Consumer Product Safety Commission
2440 East-West Highway
Bethesda, MD 20814-4408

Dear Ms. Kyle:

This letter concerns two topics: the baseball face guard standard, and the industrial eyewear standard.

As we discussed at our meeting on January 25 in Knoxville, I believe that CPSC should adopt ASTM F910 as the standard for face protectors for youth baseball batters and baserunners. There have been no known injuries to the eye or face in any of the approximately 500,000 players wearing protectors meeting the specifications of ASTM F910, which have been mandated in the Dover, NH, South Side Little League and the Dixie Little League. Existing protectors are acceptable to the players who use them, and do not impede performance. In fact, the protectors may enhance performance by eliminating fear of being hit in the face by the ball. However, the standard does need revision and should be revised as discussed at the Knoxville meeting.

Dr. Robert Crow had two main concerns regarding currently available protectors:

- *The protector may interfere with access to the airway of a player who has a suspected fracture of the cervical spine and also requires airway access.* If this occurs, it is most likely that the helmet would be gently removed while stabilizing the neck, but it could be argued that it may be safer to leave the helmet in place and remove the face guard. This concern was addressed at the meeting, and the standard will now state that the manufacturer must provide detailed instructions for emergency removal. It was noted that the expected occurrence of this emergency is extremely small when compared to the large number of eye, teeth, and facial injuries which will be prevented by the face guard. I have not heard of any case in which a face protector which was permanently affixed to a helmet in a sport such as automobile racing, motorcycle racing, downhill ski racing, or BMX bicycle racing has presented problems accessing the airway when there was also suspicion of fractured cervical vertebrae.
- *Visual field defects caused by existing protectors are potentially hazardous to the player.* The visual field defects cited by Dr. Crow at the ASTM baseball symposium in Atlanta (December 6, 1995),

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were clearly not possible from the tested products. I discussed this with Dr. Crow and offered to do subjective and objective visual fields, which I presented at the January 25, 1996, Knoxville meeting. I objectively plotted field defects, which I consider minimal, with both wire and polycarbonate face shields which pass ASTM F910. However, these defects were almost impossible to find on a subject wearing a wire face protector. Subjective field defects, of no real significance to performance as a batter or baserunner, were found with the polycarbonate protectors. These visual field data, combined with the experience of half a million protected players, led me to conclude that the field defects neither pose a safety problem nor interfere with performance.

At the Knoxville meeting, Dr. Crow produced a report from a second consulting ophthalmologist whose results contradicted those of Dr. Crow's first consulting ophthalmologist. The second ophthalmologist plotted fields which could more reasonably be obtained from the polycarbonate protector; he differed with my opinion in that he felt that these defects could be a potential hazard. The second ophthalmologist had all of my data available to him, yet he did not do objective or full threshold fields, did not state the density of the defects, did not test the wire face guards, and did not give any evidence as to the hazards claimed. Although this second ophthalmologist contradicted the fields performed by Dr. Crow's first consultant, Dr. Crow did not produce the reports of the two consultants for comparison. I believe that the visual fields produced by Dr. Crow's second ophthalmolopgist are more realistic, but exaggerate the field defects and do not support the allegation that they are a potential hazard.

Further objective field testing could be done by a lab with a computerized goniometer (CSA has this set up for hockey masks), but I do not believe that this is necessary. There simply is no evidence of any injury which could be attributed to visual field loss in any batter or base runner wearing an existing protector that passes ASTM F910. One Little League team won the Little League world series wearing face protectors. Baseball face protectors do not interfere with visual field more than other commonly used face protectors (ice hockey, football, lacrosse, downhill ski racing, automobile and motorcycle racing, BMX bicycly racing, catcher's/umpire baseball face mask) which have proven effective and have not been associated with injury because of visual field compromise.

I believe that the concerns raised by Dr. Crow should be viewed with the knowledge that he is a manufacturer of a product, the "C" flap, which cannot pass the current standard. I have tested the commonly used baseball eye protectors, presented the results at the Atlanta ASTM baseball symposium, and submitted the results to ASTM for publication (copy enclosed). As is evident, the "C" flap does not give adequate protection to the eyes, even when impacted directly on the protector from a 45° angle. If ASTM F910 is

revised so that the "C" flap, as currently designed, passes, I believe that a real hazard to the eyes, teeth, and face would result. The "C" flap does not at all protect the eye opposite the protector, and thus gives no protection against the deflected ball or to the player who turns into the ball trying to avoid being hit. Even when the "C" flap is impacted directly, eye contact occurs. It is possible that the "C" flap will give a false sense of security and actually result in an increase in injuries as the player becomes bolder while being inadequately protected. This scenario probably occurred when hundreds of squash and racquetball players suffered serious eye injury while wearing open eyeguards, which were highly acclaimed by manufacturers, but could not pass ASTM F803 for racket sports.

As a separate issue, I am concerned with ANZI Z87 impact requirements for industrial safety eyewear. I believe that the standard does not reflect the state of the art and should be modified. I would like the name of the proper authority to request an investigation of the mechanism of ANSI Z87 standards public review and establishment of an all-inclusive reporting mechanism for safety eyewear failure. It seems that if protection is mandated, then there is the obligation to be certain that the standard governing the protector performance is determined reasonably for the protection of the worker rather than possibly protecting existing products which are no longer state-of-the-art. Enclosed is a paper submitted to JAMA (as yet not reviewed) outlining the reasons for these concerns.

It was good to see you again. Thank you for your consideration.

Sincerely yours,

Paul V.

Paul F, Vinger, M.D.

encl: Baseball, ASTM
Shattered Spectacles

cc Tod Turriff
Prevent Blindness America
500 East Remington Road
Schaumburg,IL 60173

P. David Halstead
153 Alumni Memorial Building
The university of Tennessee
Knoxville, TN 37996-1506

VISUAL FIELD ANALYSIS OF BASEBALL FACE GUARDS
December 23, 1995

All protectors mounted by manufacturer

Home safe mounted on Rawlings PL 95 large 7 1/8-7 1/4 helmet
Helmet brim to top of face guard = 42.7 mm
Face guard bars = 9.7mm vertical height
Clear central braces = 39.4mm (upper); 43.9mm (lower) with 20.1mm opening in lower.

Shutt mounted on Rawlings PL 95 large 7 1/8-7 1/4 helmet
Helmet brim to top of face guard 50.5mm
Wire diameters 5.3mm
One central wire. Space between mid wires = 42.2mm

C flap mounted on Rawlings PL 95 large 7 1/8-7 1/4 helmet

Visual fields

#1 Goldman II4E, adult 40 year-old-woman, trained observer. The test object, $1mm^2$ at 33.3 cm approximates the visual angle subtended by a baseball at 70 feet.
#2 Humphrey full threshold, central 30 degrees, adult 40 year-old-woman, trained observer
#3 Humphrey full threshold, peripheral 30 to 60 degrees, adult 40 year-old-woman, trained observer
#4 Objective. Helmet mounted on Aldersen 50 percentile headform, attached to gimbal
Headform pupil size 3 mm with 64 mm interpupillary distance
Observation of pupil occlusion from 20 feet with 40 power telescope

Results:

#1 Goldman: all helmets cut the superior field to approximately 15 degrees centrally. There were no scotomas in the central 35 degrees with any mask. The wires of the Schutt mask could not be plotted as scotomas. There were no scotomas with the Home Safe, except for a mild relative scotoma inferonasally in the left eye only between 35 and 45 degrees.

#2 Humphrey full threshold.
Central 30: no defects with any face protector.
Peripheral 30 to 60: Some increase in threshold below 30 degrees in Home Safe and infero nasally in Schutt.

#3 Objective. Home Safe approximately 3 degrees of scotoma at 17 to 20 and 39 to 42 degrees below. No central or paracentral scotoma. Schutt: approximately 2 degrees of scotoma 22 to 24 and 45 to 47 degrees.

Conclusions:

The C flap gives the fullest visual field. Scotomas could be measured objectively with both the Home Safe and Schutt face protectors. The objective measurements could be confirmed by means of full threshold testing, but only beyond 30 degrees. The scotomas could not be found at all on Goldman field testing with the Schutt and barely detectable inferonasally in the left eye only with the Face Guard.

The Goldman field most likely is representative since the test object is moving and approximates the retinal image of a baseball at approximately 70 feet. Any of the tested products should give the player adequate visual field to use in baseball batting and baserunning. This is confirmed by excellent game performance in the field by players wearing these products, with no reported injury as a result of diminished field.

Paul Vinger, M.D.

Paul F. Vinger[1]

BASEBALL EYE PROTECTION: THE EFFECT OF IMPACT BY MAJOR LEAGUE AND REDUCED INJURY FACTOR BASEBALL ON CURRENTLY AVAILABLE EYE PROTECTORS

REFERENCE: Vinger, P.F., "Baseball Eye Protection: The Effect of Impact by Major League and Reduced Injury Factor Baseball on Currently Available Eye Protectors," International Symposium on Safety in Baseball and Softball, ASTM STP 1313, Earl F. Hoerner and Francis A. Cosgrove, Eds., American Society for Testing and Materials, Philadelphia, 1996.

Abstract: Currently used eye protectors were tested with major league (ML) and reduced injury factor (RIF 1) baseballs at normal speeds of play. Catchers' face masks and protectors which passed ASTM F910 gave satisfactory protection. The helmet mounted C flap and most other protectors were not satisfactory. Eye protectors which pass the standard for women's lacrosse come the closest to giving adequate, but incomplete protection for baseball. Three-mm center thick polycarbonate spectacle lenses have satisfactory impact resistance, but none of the tested frames could retain the lens and prevent eye contact. The data is insufficient to comment on the influence of ball hardness on the effectiveness on eye protectors in baseball.

Keywords: Baseball, eye protection, eye injuries, sports, trauma, shattered spectacles, reduced injury factor

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Baseball is a significant cause of eye injury to young people, with approximately 4,000 eye injuries from baseball in the 5-14-year age group each year in the United States. [1] The fact that baseball is one of the leading cause of sports eye injuries seen in emergency rooms must be viewed in light of the huge number of participants. Although the risk of eye injury is far greater to a boxer, a racquetball player or an unprotected hockey player, eye injuries from baseball, because of the vast number of players, are a

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[1]Director, Vision Performance and Safety Service, Associate Clinical Professor of Ophthalmology, Assistant Clinical Professor of Community Health, Tufts Medical

concern.

Baseball eye injuries tend to be serious. Twenty three (5.6%) of the 409 baseball eye injuries reported by the Canadian Ophthalmological Society 1972 to 1992 caused blindness in the injured eye. [2] Six (33.3%) of 18 baseball eye injuries seen by Lexington Eye Associates between 1984 and 1986 have a potential for late complications from the injury. Eyewear failure can cause injury. A professional player was struck with the ball while fielding. His sunglass lens shattered and caused a corneal laceration which required surgical repair. [3]

Products currently used to protect the eyes from baseball injury include: helmets with attached faceguards, plano eye protectors, frames supplied with plano or prescription polycarbonate lenses, and sports sunglasses. Advertisements for some of the products specifically mention baseball.

ASTM has a Standard Specification for Face Guards for Youth Baseball, ASTM F 910, but no standard exists for other eye protective devices to be used for those baseball players who are not wearing a faceguard attached to a helmet while playing. The most stringent eyewear standard available is ASTM F 803 the Standard Specification for Eye Protectors For Use by Players of Racket Sports. Women's lacrosse impact standard specifications were added to ASTM F 803 in 1994.

Is eyewear that passes ASTM F 803 sufficient for use in baseball?. Does the use of a reduced injury factor baseball make the sport safer from eye injury?

EXPERIMENTAL METHOD:

All available spectacle lenses, 55 mm diameter, -3.00 diopters, were hit with various test objects (airgun pellet; golf, tennis, and lacrosse balls) at increasing speeds to determine the force required to shatter the lens, then with the major league baseball at speeds between 39.6 m/s (88.6 mi/h) and 60.4 m/s (135.0 mi/h) (Figure 1)

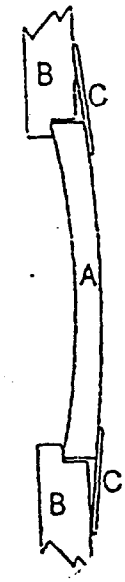


FIG. 1—Schematic of spectacle lens holder

A. Spectacle lens, —3.00 diopter, edged round to 55 mm diameter

B 6.4-mm (0.25 in) steel plate with 57.2 mm (2.25 in) anterior recess for lens and 50.8-mm (2.0 in) hole, leaving lens slightly loose in holder with approximately a 2 mm posterior support lip

C. Plastic clips to hold lens in steel plate

A total of 93 impacts with major league (Rawlings) baseball and the softest available RIF 1 (Worth) baseball were delivered to 22 eye protectors from 13 manufacturers. The speeds chosen were those commonly encountered in baseball—between 19.8 m/s (44.3 mph) and 37.8 m/s (84.5 mph). The balls were propelled by an air canon, speed measured, and the result at the time of impact photographed. (Figure 2) Protectors were carefully fit onto a CSA headform representing a 13 year old male and an adult female; the headform which was mounted on a spring-hinged platform.

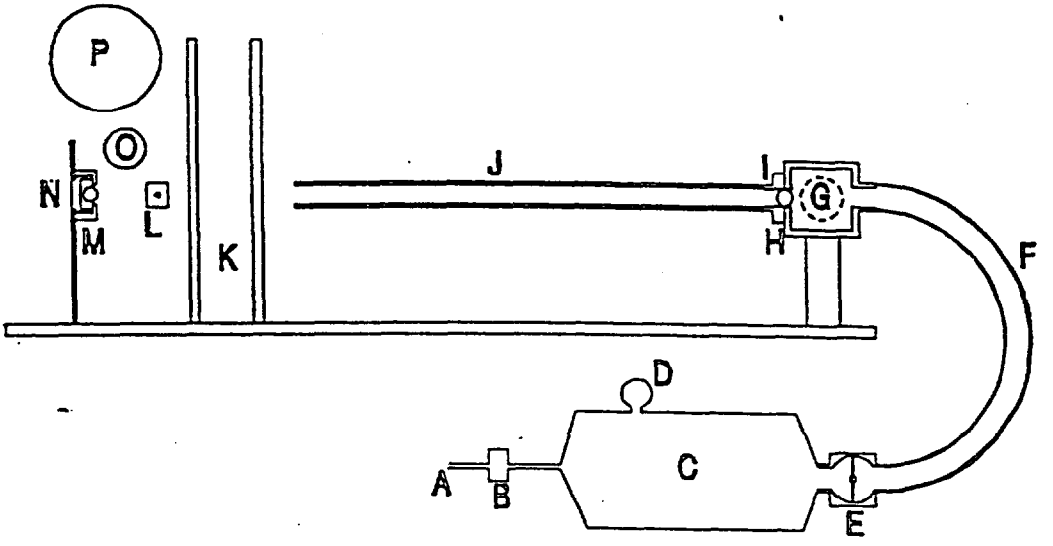


FIG. 2—Schematic of test equipment

Designed by Preston Fiske, made by Dominic Lasorella; modified from designs of Roger Amorosi and Chauncey Morehouse; photography consultation by Eugene O'Connell.

A. Compressed air source pressure regulated between 60 and 120 psi. Speedaire 20-gal. air compressor model 5Z645B; Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, IL 60714

B. R119 regulator; Watts FluidAir, Kittery, ME 03904

C. 30-gal. air tank model 5Z359; Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, IL 60714

D. Pressure gauge, 0 to 60 PSI; Watts FluidAir, Kittery, ME 03904

E. Electronic valve, Honeywell #703N13; Skinner Valve, New Britain, CT

F. 2-inch diameter air hose

G. Breech

H. Ball: major league, Rawlings, diameter 7.3 cm (2.9 in), 145.3 gm (5.1oz)
Ball: RIF 1, Worth, diameter 7.3 cm (2.9 in), 138.0 gm (4.9oz)

I. Flange to mount interchangeable barrels

J. PVC 1120, SCH 40 barrel, internal diameter 7.6 cm (3 in), length 152.4 cm (5 ft)

K. Model 55 Ballistic screens with model 35P chronograph; Oehler Research, Inc., P.O. Box 91355, Austin, TX 78766

L. Laser system model 1606 with Universal delay model 1707C; Kapture Group, 12620 Lamplighter Square, St. Louis, MO 63128

M. Spring-hinged headform table, adjustable X,Y,Z.

N. Eye protector mounted on CSA 13-year-old male/adult female headform.

O. Camera: Mamiya RZ67 Professional with 150mm f3.5 lens and #1 45 mm auto extension tube, Polaroid film #667 ISO 3000

P. High-speed strobe. EG&G microflash system 549; EG&G Electro-optics, 35 Congress Street, Salem, MA 01970

RESULTS:

The test data are summarized in Table 1. Because common usage refers to baseball speeds in miles per hour (mph), results will be expressed in mph, rather than meters per second (m/s). To convert from mph to m/s multiply by 0.4470. Except for face guards attached to helmets, a new protector was used for each impact.

Catcher's Mask

The standard catcher's mask, also used by umpires, prevented eye contact with both major league (ML) and reduced injury factor #1 (RIF 1) baseballs at the speed required in ASTM F 910: 67.1 +/- 4.9 mph (8 impacts). (Figure 3).

FIG 3: Catchers' mask RIF 1 67.5 mph

Faceguards Attached to Helmets

Three polycarbonate and one wire face guard were attached to baseball helmets by the manufacturers. Polycarbonate shields were spaced at 1.7, 2.0 and 2.1 inches from the helmet brim. All face guards passed ASTM F 910 and prevented eye contact from RIF 1 baseballs at speeds between 51.8 and 84.5 mph (7 impacts) and ML baseballs at speeds between 46.4 and 79.8 mph (7 impacts). However, it was possible for balls to squeeze between the top of a polycarbonate eyeguard and the helmet brim (no eye contact occurred) when the space between the helmet brim and the polycarbonate eye protector equaled or exceeded 51 mm (2 inches) and the ball speeds exceeded 71.6 mph (ML) and 81.8 mph (RIF 1).The wire shield bent when struck by a ML ball at 71.6 mph, but there was no eye contact. (FIGURE 4,5,6)

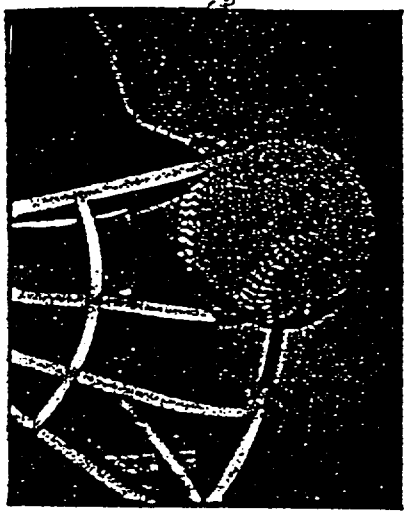


FIG 4: RIF 1, 70.2 mph

FIG 5: ML, 79.7 mph, 2 inch space. No eye contact, but ball squeezing through.

FIG 6 ML, 51.8 mph 1.7 inch space

TABLE 1

Protector type	Code #	RIF pass (mph)	RIF fail (mph) contact	ML pass (mph)	ML fail (mph)
Catcher's Face mask	20	67.5 x 4		67.5 x 4	
Helmet with faceguard ASTM F910	14, 15, 16, 17	51.8, 52.5, 70.2, 77.7, 78.4, 81.8*, 84.5		46.4, 51.8, 64.8, 71.6, 71.6*, 74.3, 79.8*	
Helmet with "C" Flap impact from front	22		69.5 eye contact		68.2 eye contact
Helmet with "C" Flap impact from 45°	22		68.2 eye contact		
Women's lacrosse eye protector	19		77.0 lid contact	65.5	
	21	75.0		66.8	70.9 lid contact
Racket sport eye protector ASTM F 803 over spectacle goggle	6	58.6	68.2 lid contact	44.3, 46.4, 59.3, 62.0	50.5 lid contact 65.5 lid contact 71.6 eye contact
Racket sport eye protector ASTM F 803 plano moulded	3		53.2 lid contact 70.9 eye contact		51.3 eye contact 72.3 eye contact
	4	47.0	70.9 eye contact		54.5 eye contact 65.5 shattered
	5		52.5 broke** 75.7 cracked		47.7 eye contact 71.6 shattered
	1 ###	51.1, 74.3			45.7 lid contact 47.0 shattered 52.5 shattered 68.2 shattered
Plano protector not tested to ASTM F 803	10		59.3 eye contact 77.0 eye contact		50.5 eye contact 70.2 eye contact
Sport frame polycarb.lens ASTM F 803	12		52.5 lid contact 71.6 lid contact	45.7	71.2 cracked ***
	13	76.4	58.6 eye contact		51.1 lid contact 72.3 eye contact
	11	72.3	55.2 lid contact 75.0 lid contact		51.8 eye contact 69.5 eye contact
Sport frame polycarb. lens not ASTM F 803	18		49.8 lid contact 66.1 lid contact @@		49.8 lid contact @ 75.0 eye contact ***
	2		56.6 cracked ## 75.7 shattered # [illegible].0 eye contact		53.2 shattered # 72.3 shattered #
Industrial eyewear (ANSI Z87)	7 ###		60.0 eye contact 78.4 eye contact		54.5 eye contact 72.3 eye contact
Sports sunglasses	8		56.6 lid contact 73.6 shattered		49.1 shattered 66.1 shattered
	9		56.6 eye contact		46.4 eye contact 66.8 eye contact

TABLE 1 (continued)

*	ball partially deformed through helmet/guard, no eye contact
**	broke at nose piece, optical portion of protector intact, no eye contact
***	frame cracked, eye contact. 3-mm Rx polycarbonate lens intact
@	lens popped through frame. 3-mm polycarbonate lens intact
@@	frame cracked, lid contact. 3-mm Rx polycarbonate lens intact
#	frame shattered, eye contact, 3-mm polycarbonate lens intact
##	frame cracked, no shards, intact 3 mm polycarbonate lens popped out
###	tested elsewhere and recommended for youth baseball

C Flap Attached to Helmet

A C flap protector which was attached to a helmet by the manufacturer permitted full-force contact between the ball and the eye when the ball was aimed at the eye of the headform directly from the front. (Figure 7) When the headform was rotated 45 degrees, so that the ball directly struck the C flap, the force of impact by a RIF 1 ball at 68.2 mph caused bending of the C flap which resulted in significant contact between the edge of the C flap and the eye of the headform. (Figure 8)

FIG 7: RIF 1, 69.5 mph

FIG 8: RIF 1, 68.2 mph

Plano Women's Lacrosse Eye Protectors

Both protectors prevented eye contact with ML balls at 65.5 and 66.8 mph. One protector permitted lid contact with the ML ball at 70.9 mph, while the other allowed lid contact when struck by the RIF 1 ball at 77 mph. (Figure 9)

Plano Racket Sport Eye Protectors

All of the racket sport eye protectors allowed lid or eye contact. Some shattered into sharp shards at relatively slow speeds. One protectors, with a tendency to shatter (Figure 10) was recommended for use by youth baseball players.

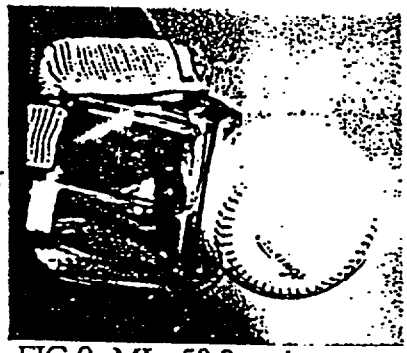


FIG 9: ML, 59.3 mph

FIG 10: ML, 52.5 mph

Industrial Safety Eyewear (ANSI Z 87)

The polycarbonate molded industrial eyewear was tested because it was specifically advertised for use by youth baseball players. The protector bottomed out, allowing eye contact. The temple dislodged from the frontpiece with each impact. (Figure 11)

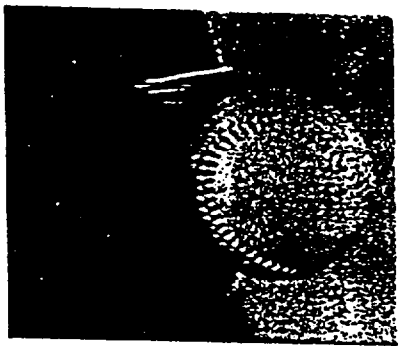


FIG 11:RIF 1. 54.5 mph

Sports Sunglasses

One of the products, commonly used by baseball players, allowed eye contact(Figure 12), while the other shattered into sharp shards. (Figure 13)

Spectacle Lenses

It was known from testing with other projectiles that all glass, CR-39, and high-index lenses did not have sufficient impact resistance to be recommended for use in baseball. To give a margin of safety, all lenses were retested with baseballs at 94 mph. This test confirmed that all (including industrial safety) spectacle lenses made of glass, CR-39 plastic, and high-index plastic shattered. (Figure 14) At 94-mph ML ball impact, 1-mm center thick polycarbonate lenses dented but did not crack. At 116 mph, the 1.5-mm center-thick polycarbonate lenses remained intact, but demonstrated posterior bowing of approximately 8 mm. (Figure 15) Three-mm center thick polycarbonate spectacle lenses remained intact, without demonstrable posterior bowing at speeds of 135 mph. (Figure 16) Testing was discontinued at this speed because the lens holder broke from the impact force of 259 Joules.

FIG 12: ML, 46.4 mph
Eye contact

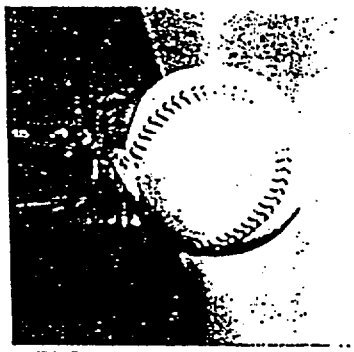


FIG 13: ML, 66.1 mph

FIG 14:ML, 115.9 mph. Glass, heat treated spectacle lens, 1.5 mm center thickness.

Sports Frames With Polycarbonate Spectacle Lenses

None of the 3-mm center thick polycarbonate lenses broke; however all of the sports frames allowed contact with the eye or lid. Some frames shattered into sharp fragments. (Figure 17)

CONCLUSIONS:

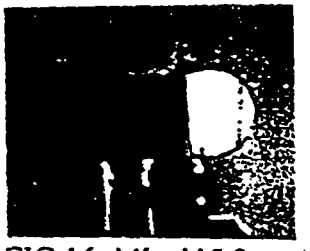


FIG 16: ML, 115.2 mph. 3-mm center thick polycarbonate. No posterior bowing

FIG 17: RIF 1, 70.2 mph

1. Existing catchers'/umpires' face masks, with openings over the eye of 43 mm (1.7 inches) are effective.
2. ASTM F 910 is an appropriate standard. There was no eye or face contact by the ball with face guards tested to ASTM F 910. Wire faceguards with openings between the helmet visor and the wire of 47 mm (1.86 inches) were effective. Polycarbonate face guards should have openings over the eyes of 43 mm (1.7 inches) since the ball penetrated (with potential, but no actual eye contact) at speeds over 70 mph when the opening between the rim of the helmet and the top of the faceguard was over 2 inches There was no penetration at these speeds when the opening was reduced to 1.7 inches.

FIG 15: ML, 115.9 mph. 8mm posterior bowing. 1.5 mm center thick polycarbonate lens intact

3. The helmet is an integral part of the protective device for those polycarbonate eyeguards that are helmet-mounted and depend on the helmet visor to prevent penetration. There should be a standard for visor stiffness, so that possible future decreases in helmet stiffness do not negate the protective value of popular and effective faceguards.
4. The helmet-mounted C flap does not give adequate eye protection for baseball.
5. None of the tested plano eye protectors were completely satisfactory for baseball. Those that passed the standard for women's lacrosse gave the best results.
6. The racket sport standard F 803 is not sufficient for baseball. Several protectors shattered into sharp shards which almost certainly would have resulted in potentially blinding lacerations. Other protectors would have given some degree of protection, in that they did not shatter and prevented eye contact approximately 50 percent of the time.
7. Impact testing for baseball should be added to ASTM F 803 as was done for women's lacrosse.
8. Consistency in testing is critical and should be done by an independent testing laboratory to an ASTM standard. One possible cause of the difference between these tests and those done at another laboratory may the headform and its mounting. The NOCSAE headform, used at the laboratory which recommended a product that shattered under these test conditions, was mounted on a sliding table. The Canadian Standards Association headform, used for the tests described here, was mounted on a spring-hinged platform. It is not known which headform mounting and which headform characteristics more closely mimic the as-worn condition by the player. It seem that, given the possibility of catastrophe, those lenses which shattered should be withdrawn from the

baseball market until this issue is resolved.
9. Polycarbonate spectacle eyewear, with 3-mm center thickness is extremely tough and awaits better frames for use in baseball.
10. Further study is needed. Agreement on headform specifications and headform mounting is critical.
11. The data are insufficient to comment on the influence of ball hardness on the effectiveness of eye protectors in baseball.

REFERENCES:

[1] CPSC data gathered by National Society to Prevent Blindness, 1991 eye injuries associated with sports and recreational products,Fact sheet, Schaumberg, IL. 1991.

2. Pashby T.J., "Eye injuries in Canadian sports and recreational activities," Can J Ophthalmol Vol. 27, 1992, p226.

3. Vinger P.F., "The eye and sportsmedicine," In: Duane TD, Jaeger EA, eds. Clinical Ophthalmology, Ch 45, Vol 5, pp 1-103, J.B.Lippincott Company, Philadelphia, 1994.

D

CONSUMER PRODUCT SAFETY COMMISSION

Sunshine Act Meeting

AGENCY: U.S. Consumer Product Safety Commission.

TIME AND DATE: 11:00 a.m., Tuesday, August 6, 1996.

LOCATION: Room 714, East West Towers, 4330 East West Highway, Bethesda, Maryland.

STATUS: Closed to the Public.

MATTER TO BE CONSIDERED:

Children's Sleepwear Enforcement

The Commission will consider issues related to the enforcement of the children's sleepwear standard.

The Commission decided on August 1, 1996, that agency business required scheduling this meeting without the usual seven days advance public notice.

For a recorded message containing the latest agenda information, call (301) 504–0709.

CONTACT PERSON FOR ADDITIONAL INFORMATION: Sadye E. Dunn, Office of the Secretary, 4330 East West Highway, Bethesda, MD 20207 (301) 504–0800.

Dated: August 2, 1996.

Sadye E. Dunn,

Secretary.

[FR Doc. 96–20160 Filed 8–2–96; 2:23 pm]

BILLING CODE 6355–01–M

Petition Requesting Development of Safety Standard for Protective Batting Helmets and Staff Report

AGENCY: Consumer Product Safety Commission.

ACTION: Notice.

SUMMARY: In 1994, the American Academy of Facial Plastic and Reconstructive Surgery petitioned the Commission to develop a safety standard for protective batting helmets used by children younger than 15 years of age to require these helmets to be manufactured with a face guard. In 1996, the Commission staff published a report about injuries to children associated with baseball and the types of protective equipment currently available to prevent those injuries. The Commission solicits written comments on the petition and on that portion of the report concerning facial injuries and batting helmets with face guards.[1]

[1] The Commission voted 2–1 to publish this notice, with Commissioner Mary Shiela Gall dissenting. Commissioner Gall's statement concerning her vote is available from the Office of the Secretary.

DATES: Comments on the petition and the report should be received in the Office of the Secretary by September 20, 1996.

ADDRESSES: Comments on the petition should be mailed to the Office of the Secretary, Consumer Product Safety Commission, Washington, DC 20207, telephone (301) 504–0800, or delivered to the Office of the Secretary, room 502, 4330 East-West Highway, Bethesda, Maryland 20814. Comments should be captioned "Petition and Report Concerning Batting Helmets with Face Guards." Five copies are requested of each submission in response to this notice.

A copy of the petition, comments on the petition submitted before July 26, 1995, and the document entitled "Youth Baseball Protective Equipment Project—Final Report" are available for inspection at the Commission's Public Reading Room, room 419, 4330 East-West Highway, Bethesda, Maryland. To obtain a copy of the petition, comments on the petition, or "Youth Baseball Protective Equipment Project—Special Report," call or write Rockelle Hammond, Office of the Secretary, Consumer Product Safety Commission, Washington, D.C. 20207; telephone (301) 504–0800.

FOR FURTHER INFORMATION CONTACT: For information about the petition or the staff report, call or write Susan B. Kyle, Directorate for Epidemiology and Health Sciences, Consumer Product Safety Commission, Washington, D.C. 20207; telephone (301) 504–0470, extension 1210.

SUPPLEMENTARY INFORMATION: In 1994, the American Academy of Facial Plastic and Reconstructive Surgery petitioned the Commission to develop a safety standard for protective batting helmets intended for children. The petition, designated HP 95–1, requests development of a standard requiring batting helmets intended for children younger than 15 years of age to be manufactured with a face guard which meets the requirements of the Safety Specification for Face Guards for Youth Baseball (ASTM F910), published by ASTM (formerly the American Society for Testing and Materials). The petition includes two articles from the journal "Pediatrics." These articles state that batting-related injuries are a leading cause of sports-related eye injuries and that the Sports Eye Safety Committee of the National Society to Prevent Blindness has endorsed requiring face guards with batting helmets. The petition asserts that the use of batting helmets without face guards by children younger than 15 years of age creates an unreasonable risk of injury.

In the Federal Register of November 1, 1994 (59 FR 54548), the Commission published a notice to solicit written comments on the petition. In response to that notice the Commission received four comments, all of which urge denial of the petition.

Two comments observe that the risk of being injured from impact of the ball is inherent in the game of baseball. One of these comments states that helmets meeting the requirements of the standard requested by the petition would add to the frustrations of young players and detract from their enjoyment of the game.

Two other comments state that the ASTM standard for face guards should not be incorporated into a mandatory standard. These comments state that the adequacy of protection afforded by this standard has not been adequately evaluated, and that compliance with the standard could reduce the player's field of vision and access to the airway of an injured player.

In 1995, the Commission staff began a study of the circumstances surrounding facial injuries associated with baseball and softball. On July 14, 1995, the Commission voted to defer a decision on the petition until the results of that study became available.

In May 1996, the Commission staff completed a report entitled "Youth Baseball Protective Equipment Project—Final Report" (the Final Report). That document provides information about injuries to children associated with baseball, and about protective equipment available to prevent those injuries. The Final Report discusses, among other things, a survey of injuries associated with baseball, softball, and T-ball treated in hospital emergency rooms during the spring and summer of 1995. A copy of the complete Final Report is available without charge by writing or calling the Office of the Secretary, Consumer Product Safety Commission, Washington, D.C. 20207; telephone (301) 504–0800.

From the survey of injuries associated with baseball, the Commission staff estimates that about 37 per cent (59,400) of the total youth baseball-related injuries treated in hospital emergency rooms were facial injuries. About 74 per cent of these facial injuries resulted from being hit by a ball; 19 per cent resulted from being hit by a bat; and about 7 per cent resulted from colliding with another player.

Batters sustained 11 per cent of all facial injuries. Almost 98 per cent of the injured batters were batting righthanded. For these right-handed

batters, 56 per cent of the facial injuries were to the left side of the face (the side toward the pitcher); 28 per cent were to the right side of the face; in the remaining 16 per cent, the location of the injury on the face was unknown.

For the youngest children, ages five through seven years old, facial injuries represented a high proportion of all injuries (59 to 84 per cent). Facial injuries accounted for 50 per cent or more of all injuries for players younger than 10 years of age.

For five-year-olds, facial injuries were divided almost evenly between organized play (53 per cent) and unorganized play (47 per cent). Facial injuries in organized play predominated in all other age groups, consisting of 72 to 96 per cent of all injuries.

The Commission staff estimates that 2.1 to 3.5 million protective batting helmets are in use by players in all organized youth leagues during a single season. About 4 to 10 per cent of these helmets are likely to have face guards. The Commission staff also estimates that about 125,000 to 200,000 face guards were sold during the years 1994 and 1995.

The results of the 1995 survey of injuries to children associated with baseball and other information contained in the Final Report were not available when the Commission requested comments on the petition in 1994. Therefore, the Commission now solicits comments on the petition and those portions of the Final Report concerning facial injuries and face guards.

Additionally, the Commission solicits information on the following topics:

- The expected useful life of face guards;
- The number and types of any injuries associated with the use of face guards;
- The number of children who participated in organized and/or unorganized play, by age;
- Any information about the effectiveness of face guards to prevent or reduce injuries; and
- Information about annual sales of face guards for the past ten years, and projected sales for the next five years.

Dated: July 31, 1996.

Sadye E. Dunn,

Secretary, Consumer Product Safety Commission.

[FR Doc. 96–19882 Filed 8–5–96; 8:45 am]

BILLING CODE 6355–01–P

CORPORATION FOR NATIONAL AND COMMUNITY SERVICE

Revision of the National Senior Service Corps' Project Progress Report (A–1020)

AGENCY: Corporation for National and Community Service.

ACTION: Notice of 30-day OMB review of Project Progress Report.

SUMMARY: On June 4, the National Senior Service Corps (NSSC) announced a 60-day review and comment period during which project sponsors and the public were encouraged to submit comments suggesting revisions to the NSSC Project Progress Report (PPR) used by project sponsors (grantees) to report progress made toward work plan accomplishment, problems encountered, resources generated and budget variances from the grant awarded.

Comments were invited on (1) whether the existing PPR appropriately meets project oversight and operational management, planning and reporting needs of the Senior Corps programs; (2) ways to enhance the quality, utility and clarity of the PPR; (3) accuracy of agency estimates of reporting burden; and (4) ways to further reduce burden on respondents.

NSSC is requesting extension of the authorization to use the PPR in its current form with grants funded in 1997. However, revising and phasing in of a new form in conjunction with planned implementation of the impact programming initiative and redesign of the Project Grant Application is anticipated for grants funded in 1998.

DATES: The National Senior Service Corps and the Office of Management and Budget will consider written comments on the Project Progress Report and record keeping requirements which are received within 30 days from the date of publication.

Addressess to Send Comments to both:

Janice Forney Fisher, NSSC, Rm 9403A, Corp. for National Service, 1201 New York Avenue, NW., Washington, D.C. 20525

Deborah Bonds, Office of Info. & Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503

Estimated Annual reporting or Disclosure Burden: 18,400 hours.

Established projects (over 80 percent of NSSC grantees) report twice annually. First-year projects, new components, demonstrations, and projects experiencing problems or with substantial project revisions will continue to report quarterly, as identified in the Notice of Grant Award (NGA).

FOR FURTHER INFORMATION CONTACT: Janice Forney Fisher (202) 606–5000 ext. 275.

This document will be made available in alternate format upon request. TDD (202) 606–5000 ext. 164.

Regulatory Authority: National Service Trust Act of 1993.

Dated: July 31, 1996.

Thomas E. Endres,

Deputy Director, National Senior Service Corps.

[FR Doc. 96–19929 Filed 8–5–96; 8:45 am]

BILLING CODE 6050–28–M

Proposed Changes to AmeriCorps State, National, and Tribes and Territories Application Guidelines for the Program Year 1997 Grant Cycle

AGENCY: Corporation for National and Community Service.

ACTION: Request for comment on proposed changes in policy and guidelines for AmeriCorps State, National, and Tribes and Territories applications.

SUMMARY: The Corporation for National and Community Service is proposing changes to and inviting comments on its application guidelines for AmeriCorps programs: AmeriCorps State and National programs; and AmeriCorps Tribes and Territories. The proposed changes were developed in response to recommendations from programs and experience over the last two years. The changes were also developed to reduce the federal cost of AmeriCorps programs to meet specific benchmarks over the next three years. A broad range of areas is covered by the proposed changes, including the following: the timeline for distribution of guidelines and submission of applications; new targets and caps on program costs per Member; revised priorities for service activities in the areas of education, public safety, the environment, and other human needs; and criteria for evaluating the quality of program applications. The Corporation invites all interested parties to submit written comments on the issues discussed in this notice. Comments received will be given careful consideration in the development of final Program Year 1997 policies and grant application guidelines.

DATES: Only written comments will be considered. Comments must be submitted no later than October 7, 1996. Faxes will not be accepted.

E

MARK STRAUCH
48 GLACIER PL.
LIVERMORE, CALIFORNIA 94550

September 6, 1996

Office of the Secretary
Consumer Product Safety Commission
Washington, D.C. 20207

Dear CPSC Secretary,

I am offering comments in regard to, *Petition and Report Concerning Batting Helmets with Face Guards.*

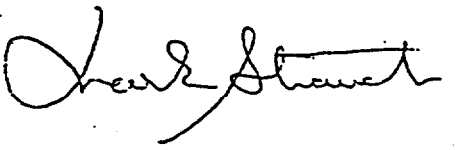
Again, I reiterate my earlier comments regarding this petition and urge the Commission to reject it. The results of the survey commissioned by staff, *Youth Baseball Protective Equipment Project--Final Report*, do not change the basic premise behind the participation of individuals in a sport that has an inherent element of risk. That is, risk in playing baseball is well know and accepted into society. I myself am a parent and well aware of the risks presented in playing baseball. I played baseball myself. There is no need for government intervention in the sport.

By the reports own admission, batters are involved in only 11% of all facial injuries. Will staff (or petitioners) now recommend protective face shields for the balance of fielders that sustain the remaining 89%? There are more important issues for the CPSC to address.

In the CPSC response to my original comments regarding this petition staff indicated that, notwithstanding my contention that risk was inherent in the sport and accepted, that things could be made safer and this was in appropriate role for the CPSC. I strongly disagree with this position. As a practicing engineer, I can assure you that there is nothing in society that cannot be made safer. There are cost/benefit trades to be made and nominal risks to be accepted in living one's life.

The legislation creating the CPSC did not charter it to make the world absolutely safe; rather it tasked it with addressing *unreasonably* dangerous things. In deciding this issue, the Commission has a rather simple question to answer: is it *unreasonable* to be hit by a baseball while playing the game and is this risk *unreasonable*? The answer is simply no, and I believe the CPSC has no statutory basis to intervene.

Sincerely,



New England Eye Center • Tufts University School of Medicine

Vision Performance and Safety Service

September 9, 1996

PAUL F. VINGER, M.D., *Director*
Associate Clinical Professor of Ophthalmology

Susan B. Kyle, Ph.D. - 593 -
Project Manager, Sports and Recreation
U.S. Consumer Product Safety Commission
Washington D.C., 20207

Comments: "Petition and Report Concerning Batting Helmets with Faceguards"

Dear Ms. Kyle:

Thank you for soliciting comments concerning faceguards on youth baseball batting helmets.

The existing Standard, ASTM F 910, is adequate to prevent injuries to batters and base runners in youth baseball.

1. Enclosed is a report presented at the International Symposium on Safety in Baseball and Softball, which demonstrates testing done on these products and shows that they will stop a baseball at speeds encountered in youth baseball. Since this Standard is adequate, another Standard would be redundant.

2. Although the Standard could be revised to allow better access to the airway, this has not proven to be a problem. Other face protectors, such as those used in motorcycle racing and automobile racing, with fixed facial protective components, are in use in sports with a greater potential for airway obstruction. If the U.S. Consumer Products Safety Commission members feel that airway access is a problem, and this can be substantiated by any data, the ASTM F 910 Standard could be revised.

3. The ASTM Eye Safety Committee will be adding a Standard for eyewear for baseball fielders. Preliminary data has been obtained and this will be discussed at the next meeting, in December. Since this project is actively ongoing in ASTM, there does not appear to be a need for Consumer Product Safety Commission to engage in a separate standards writing process.

4. The face protectors do not appear to interfere with the players' performance, visual field, or enjoyment of the game. The Little League World Series was won by a team wearing faceguards attached to helmets. Feedback obtained from players and parents is that the younger players feel more secure, are less afraid of the ball, and get more enjoyment from playing baseball because of decreased fear of being struck by the ball while batting or base-running.

MAILING ADDRESS:
297 Heath's Bridge Road,
Concord, Massachusetts 01742

TELEPHONE:
Office: 71)-1310
Home: (508) 371-2215
FAX: (508) 369-4738

5. There are a number of significant face and eye injuries to youth baseball players, which could be prevented by the use of protectors, which pass ASTM F 910 by batters and base-runners. The addition of appropriate protective Standards for use by fielders will complete the protective package.

6. Although protectors could reduce injuries, I do not believe they should be mandated by the U.S. Consumer Products Commission at this time, but highly recommended for youth batters and base-runners. A prospective study could then be designed, comparing the protected and unprotected players to acquire data on the difference in injury rate and also, perceived performance.

7. Until an ASTM Standard is written for youth baseball fielders, protective recommendations should be limited to batters and base-runners.

Thank you, Susan, for inviting commentary.

Sincerely yours,

Paul

Paul Vinger, M.D.

mdm
cc: J. Jeffers, M.D.
T. Turriff
L. Caveness
enclosure - as noted

AMERICAN ACADEMY OF PEDIATRIC DENTISTRY
211 EAST CHICAGO AVENUE ~ SUITE 700 • CHICAGO, ILLINOIS 60611-2616
312-337-2169 FAX 312-337-6329

September 16, 1996

The Honorable Sayde E. Dunn
Office of the Secretary
U.S. Consumer Products Safety Commission
Washington, DC 20207

Re: Petition and Report Concerning Batting Helmets with Face Guards

Dear Secretary Dunn:

The American Academy of Pediatric Dentistry strongly supports the development of a safety standard that would require use of a face guard on batting helmets for all children participating in baseball, softball and T-ball.

The use of face guards on batting helmets virtually eliminates any possibility of facial, eye and dental injuries in these sports. This proven safety device adds little cost to the batting helmet if incorporated into the manufacturing process.

Some have commented that the chance of being struck in the face with a ball or bat is an inherent part of the sport. This is repugnant to AAPD. To knowingly put children in danger of serious injury when simple affordable devices exist to prevent that injury is cavalier at best.

Children who are currently using these devices experience no diminution of vision or restriction of airway. In fact, experience shows that children with a face guard on their batting helmet are more confident in the batter's box because they know they are safe from getting hit in the face.

We urge the adoption of a safety standard requiring face guards on all batting helmets.

Sincerely,

John A. Bogert, DDS
Executive Director

THE UNIVERSITY OF CONNECTICUT HEALTH CENTER

School of Dental Medicine
Farmington, Connecticut 06032

Honorable Sadye E. Dunn,
Office of the Secretary
U.S. Consumer Products Safety Commission
4330 East West Highway
Bethesda MD 20207

September 12, 1996.

Dear Secretary Dunn

Re: Face Guards on Youth Baseball Batting Helmets

This is to indicate that I strongly support the petition to requiure face guards on youth baseball batting helmets. There is no doubt such a requirement will eliminate almost all oral, facial and eye injuries in the sport which has by far the highest prevalence of those three injuries,(1).

Equally important will be the predictable saving in health care costs which occurred beginning in 1976 when all organized ice hockey leagues (youth, high school and college) introduced playing rules requiring certified full face protective equipment (2),(3).

I do not have information regarding the expected useful life of available baseball face protectors but if ice hockey experiences are an indication it will be 5-8 years.

Your staff is to be commended for the extensive review of the subject in the Federal Register Vol.61 #152 August 6, 1996.

References

1. Overview of Sports-Related Injuries in Persons 5-14 Years of Age. Washington, DC; Consumer Products Safety Commission.
2. Tolpin, H.G., Vinger, P.F. and Tolpin, D.W. Optical Sports Injuries. Economic Condiderations. International Ophtalmology Clinics. Winter 1981. E.F. Vinger Ed. Little, Brown and Company, Boston MA.
3. Castaldi, C.R. Prevention of Craniofacial Injuries in Ice Hockey. Sports Dentistry. The Dental Clinics of North America. D.N. Ranalli, Ed. W.B. Saunders 1991, Philadelphia, PA.

Yours sincerely

CR Castaldi

C.R.Castaldi, DDS, MSD, FRC(Can)
Professor Emeritus of Pediatric Dentistry.

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Monica Cipes
DMD, MSD

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Pediatric Dentistry

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West Hartford
Connecticut 06119

Telephone:
(860) 233-1589

Sadye E. Dunn
Office of the Secretary
4330 East West Highway
Bethesda, MD 20207

September 17, 1996

Dear Secretary Dunn,

I am writing in support of the petition before the CPSC to require face shields on youth batting helmets.

In the 17 years I have been practicing pediatric dentistry I have treated countless oral and dental injuries attributable to youth baseball. A face shield requirement for helmets would help to eliminate these injuries, many of which seem to occur while the player is batting.

As you know, in addition to oral injuries, eye injuries are prevented as well.

I am so pleased the Consumer Product Safety Commission is taking this important step to protect children.

Very truly yours,

Monica Cipes

Monica H. Cipes, D.M.D., M.S.D.

Academy for Sports Dentistry

Honorable Sadye E. Dunn,
Office of the Secretary
U.S. Consumer Products Safety Commission
4330 East West Highway
Bethesda, Md. 20207

Sept. 17,1996

Dear Secretary Dunn,

I am a Pediatric Dentist and someone with an undying love of baseball. My father was a high school baseball coach and later a sub scout for the New York Mets. I've played baseball for as long as I can remember and have played at virtually all levels of non-professional baseball. I continue to play in an "Over Thirty" hard-ball league here in Portland, Maine. I have been an above average player at each level.

For the last six years I have become involved with baseball safety issues. This interest was rekindled by my friend, Dr Cosmo Castaldi of the University of Connecticut School of Dentistry. However my first exposure to baseball injuries came as a five year old boy. I was sitting on a hill with my mother and sisters watching my father's baseball team as one of his high school players was hit squarely in the forehead, knocking off his helmet and leaving him unconscious. He recovered without complication but the vision of him being carried of the field on a stretcher has stayed with me.

Most people haven't been personally involved with a serious base-ball injury. This is spite of the numbers which show how common they are. The perception of risk is very low. The perceived need to introduce new safety equipment is also low.

A batting helmet with an attached face protector is a piece of equipment which could protect many kids from serious injury. I have used one myself for six years and I know how easy it is to adapt to it. It doesn't impair my view and it doesn't lessen my enjoyment of the game. It looks "different" but that doesn't bother me. I pur-chased one for my ten year old son and his performance hasn't been diminished by its use. If anything, it has made him less afraid of facing the bigger pitchers.

The league in which my son plays has made helmets with face shields available but not mandatory. These are seldom used. Many coaches discourage their use. The perception is that the youngsters cannot see. The coaches (who don't perceive a risk) would rather have the kids use a different helmet rather than teach them to use the face protector.

Academy for Sports Dentistry

Since becoming involved with this issue many incidents have been brought to my attention. Incidents of eye injury and facial bone fractures have been reported. In my own community I have seen a boy with a broken nose and a young man with Down"s Syndrome with a knocked out permanent tooth. This one dental injury may not seem like much but estimates indicate that this single injury may cost over $10,000 in dental fees duringthe patients lifetime.

Major leaguers who have used face protectors after injuries have done just fine. Charlie Hayes, coming back from a facial injury from a pitched ball, used a polycarbonate face shield. He immediately went on a prolonged hitting streak. The ability to play is not hampered.

I would strongly support the increased use of face protectors for youth baseball. I would, in fact, support a mandate for all players thirteen and under in any organized baseball league. The American Academy of Pediatrics policy of strongly encouraging the use of these devices and mandating them for "functionally one eyed athletes" is reasonable although I would personally go further.

Sincerely,

Stephen C. Mills DDS

Stephen C. Mills, D.D.S.
Diplomate, American Board of
Pediatric Dentistry
Liaison, American Academy of Pediatric
Dentistry to the Academy of
Sports DEntistry

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USA BASEBALL

September 17, 1996

Ms. Susan B. Kyle
Directorate for Epidemiology
and Health Sciences
Consumer Product Safety Commission
Washington, DC 20207

Dear Ms. Kyle:

Thank you for permitting USA Baseball Medical and Safety Advisory Committee to respond to your Federal Register Notice of August 6, 1996. Our task is to assist in making baseball an even safer sport for young participants. It is for this reason we are always interested in protective equipment, certainly one mechanism to reduce injuries. The incidence of facial injuries in young baseball participants based on your study, certainly merits attempt at reduction. The availability of the polycarbonate face mask attached to the helmet has been present for several years and may well offer a partial solution to this problem. Unfortunately it is premature to mandate safety equipment before scientific study has demonstrated efficacy and acceptability by participants. Additionally, other issues must be addressed. These problems are not insurmountable and can be answered promptly:

1. Does a facial injury bias a parents decision to take a child to an emergency room, which would artificially inflate the statistical risk. For example, a recent study (Pasternack, JS: Pediatrics, October 1996) of 2,861 players demonstrated very different data. Among other issues, an overwhelming majority of face impacts occurred to defensive players. A study comparing the frequency of facial injuries with and without face masks is necessary to justify mandating face masks. Additionally, some measure of severity must be included.

2. Do we have appropriate safety standards for the manufacture of these helmets with face masks. These must include studies at all speeds with different types of balls. Additionally, studies should be performed after reasonable use. The desired result, minimal impact injury to the face should be the established standard. These standards can be developed with current technology and some standards currently exist.

3. How does the presence of the face mask affect the player and does this vary at different ages. Is vision affected? Can it be used on the base paths without being excessively bothersome. Will new injuries occur in leagues that do not ban the head-first slide? What psychological affect will the mask have? Will it create undue fear or a willingness to accept excessive risk? Will coaches neglect teaching ball avoidance techniques because of the availability of the mask? How are those variables affected by age? These variables can be appropriately studied.

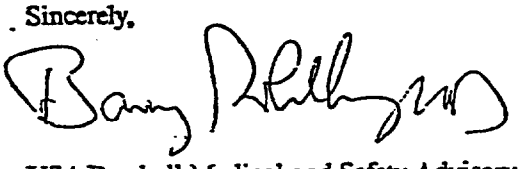
4. What is the cost and required maintenance for the addition of the mask? What is the expected useful life of the equipment? Will leagues be able to meet the costs of purchase, maintenance and supervision and will some leagues be forced to close because of these issues and the litigational problems that will arise?

Facial injuries in baseball, particularly significant injuries, should be prevented if available, effective and acceptable equipment exists. This equipment must meet established standards for various levels of play. Studies must be performed to establish incidence, efficacy, and affect on participants and leagues before the mask is made mandatory. Until that time, leagues should be made aware of the availability of face masks, the relationship to current information on risk, the products that meet established standards and the projected cost. Additionally, they

USA BASEBALL ★ 2160 GREENWOOD AVENUE ★ TRENTON ★ NEW JERSEY ★ USA ★ 08609

should be made aware of on-going studies (we have initiated a study and others may exist). With the information currently available, face masks that meet standards should certainly be permitted and probably recommended, particularly for the under 10 year old group. They should not be mandated for the issues previously presented and these issues should also be presented to the leagues. Each league can make their own independent decision. It is essential that studies be initiated promptly as not more than one year should be required to review the variables that would establish or refute the efficacy of the face mask. At that time, should the scientific information demonstrate significant efficacy and acceptance, then face masks can be mandated for specific age groups.

Sincerely,



USA Baseball Medical and Safety Advisory Committee

BG:srm

Sadler & Company INC.
Since 1945

September 20, 1996

VIA FAX (301)504-0124

Ms. Susan B. Kyle, Ph.D.
U.S. Consumer Products Safety Commission
Washington,, D.C. 20207

RE: STUDY ON BATTER'S FACEGUARD

Dear Sue:

As we have discussed on the phone, my insurance agency, Sadler & Company, is the endorsed insurance agency for Dixie Youth Baseball, Inc. (ages 5-12), Dixie Boys/Majors Baseball, Inc. (ages 13-18), and Dixie Softball, Inc. (ages 5-18). In addition, I am the Risk Manager for Dixie Baseball, Inc., which is an administrative organization which performs certain important functions on behalf of the three Dixie organizations.

We have conducted a survey on behalf of the three Dixie organizations in order to determine the effectiveness of the Batter's Faceguard in reducing the frequency of facial injuries resulting to offensive players while batting and baserunning. Our data was gathered from the Excess Accident Insurance claim forms and was input on a customized database management software program in order to track specific injuries within our programs.

Because the data was extracted from the Excess Accident Insurance claim forms, our survey does not track all injuries that occurred within the three Dixie programs as many were not reported where the injured participants sought payment only from their primary insurance carrier. In addition, we only insure about 35% of total leagues under the endorsed insurance programs. As a result, our survey is not all encompassing; however, it is the most representative sample that we are able to draw from the population of total injuries.

Despite our hard work on this project, I must disclaim that I am not a statistical expert. Furthermore, the data is subject to interpretation from our input person and has not been double checked for accuracy.

For the purposes of our survey, it was assumed that the batter's faceguard would be 100% effective in preventing all injuries where a batter was struck in the face by a pitched ball, where a batter was struck in the face by a thrown ball, where a baserunner collided with a baseman, and where a batter warming up was

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struck in the face by the baseball bat of another player warming up. We believe that our assumption is close to being valid as we have only recorded two injuries where a batter's faceguard did not prevent an injury. Both of these incidents occurred when a baserunner collided with a baseman and the batter's faceguard was mashed into the face of the baserunner. Of course, it could be argued that the injury would have been much more severe without the presence of the faceguard.

So far, our survey is limited to the 1994 and 1995 Playing Seasons. In addition, only the Dixie Youth Baseball, Inc. (ages 5-12) portion of the survey has been completed. It is important to note that during the 1994 Playing Season, Dixie Youth Baseball, Inc. had not yet mandated the batter's faceguard. Nevertheless, it is my unofficial estimate that up to 33% of all teams were already voluntarily using the faceguard for ages 5-12. Undoubtedly, more injuries would have been recorded during the 1994 survey if 33% of all teams were not already using the faceguard. 1995 was the first year when use of the batter's faceguard was mandated and thus sets the stage for the comparison of offensive facial injuries for the two years.

Our survey merely measures the frequency of occurrence of certain injuries. In the near future, we will be able to run a severity report that would determine the impact of facial injuries that could have been prevented by the use of the batter's faceguard on the basis of total medical dollars that were paid out. It is my opinion that the facial injury is more severe than the average injury in baseball and as a result, severity may be a better indication of the usefulness of the batter's faceguard.

Based upon the above mentioned methodology, the results for the 1994 and 1995 Seasons are listed in a chart on the attached page. Based on our assumptions, the batter's faceguard would have been almost 100% effective and would have prevented 5.8% of injuries during the 1994 Playing Season had it been mandated. It is interesting to note that this number could have very well been close to 8% had 0% of players not voluntarily used the batter's faceguard instead of the 33% that is estimated.

On behalf of Dixie Youth Baseball, Inc., I believe that the numbers justify that mandating the batter's faceguard was a wise decision that will protect our youth for many years to come. In addition, it must be remembered that a facial injury has potential to be much more severe than the average baseball injury, and as a result, the protection provided by the batter's faceguard is even more impressive.

Very truly yours,

John Sadler

John M. Sadler, Jr., JD, CIC
President

JMSjr/ldy

YEAR	AGE GROUP	ESTIMATED % OF PLAYERS WEARING BATTER'S FACEGUARD	TOTAL # INJURIES RECORDED IN SURVEY	TOTAL # FACIAL INJURIES TO OFFENSIVE PLAYERS	% OF OFFENSIVE FACIAL INJURIES TO TOTAL INJURIES
1994	5 - 12	33% (1)	441	26 (4)	5.8%
1995	5 - 12	95% (2)	423	3 (3)	.7%

(1) This is a rough estimate of the voluntary use of batter's faceguards based on a survey of several Dixie Officials.

(2) Even though the batter's faceguard was mandated during the 1995 Season, we may not have had 100% compliance during practice or warm ups in on-deck area.

(3) The 3 injuries were as follows:

2 caused by baserunner collision with baseman where faceguard was mashed into face of baserunner

1 caused by failure of batter to wear helmet with faceguard during on-deck warm up and being struck in the nose by a thrown bat

(4) Perhaps a statistician could adjust this number upwards to take into account what the predicted number would have been had 0% of players not been wearing a batter's faceguard.

25-Sep-96 4:43

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Kenneth R. Veenema, M.D.

Strong Memorial Hospital Sports Therapy
Alan Peppard, PT, ATC-Director

9 / 23 / 96

Susan B. Kyle, Ph.D.
Directorate for Epidemiology and Health Sciences
Consumer Product Safety Commision
Washington, D.C. 20207

Re. : Petition and Report Concerning Batting Helmets with Face Guards

Dear Dr. Kyle,

Enclosed is a copy of the September 1996 article in *Pediatrics* describing the results of our Little League injury survey. Also enclosed is a copy of the press release from the American Academy of Pediatrics regarding the study.

Our results show that Little League baseball is a safe activity with a low injury rate and a particularly low rate of severe injury. As pertains to the CPSC petition, our results found that mandatory use of face masks on batting helmets would not have prevented 86% of the facial injuries caused by the ball. Most ball-related facial injuries are sustained by defensive players. Mandating face masks on batters may reduce or eliminate facial injuries to offensive players, however this would only moderately reduce the incidence of total ball-related facial injuries. Interestingly, the 1995 CPSC baseball-related injury study similiarly found that offensive players accounted for only 13% of the ball-related facial injuries (batters 11% and baserunners 2%).

Based on the results of our study and the 1995 CPSC study, we feel that the mandatory addition of face masks to the present standard double-earflap baseball helmet used in Little League basesball is unwarranted. It may be effective, however from a public health standpoint it does not protect the group of participants most susceptible to ball-related facial injury.

Sincerely,

Kenneth R. Veenema, M.D.

Kenneth R. Veenema, M.D.

Joel S. Pasternack, Ph.D., M.D.

HOCKEY SKATING WALKING JOGGING DANCING TENNIS BASKETBALL SOCCER TRACK RUNNING FOOTBALL AEROBICS DIVING SWIM

Baseball Injuries: A Little League Survey

Joel S. Pasternack, PhD, MD*; Kenneth R. Veenema, MD*‡; and Charles M. Callahan, MD, MPH*§

ABSTRACT. *Objectives.* To determine the patterns of injury in youth baseball and apply the data to estimate the value of proposed safety equipment.

Design. Prospective population-based injury survey.

Participants. 2861 Little League baseball players (ages 7 to 18) for 140 932 player-hours.

Measurements. An injury was included in the data only if it was serious enough to require medical/dental care, caused missing a game, or disallowed playing a certain position. The injuries were subdivided into acute or overuse. The acute injuries were classified as either catastrophic, severe, or minor. Injuries were categorized according to mechanism, area injured, and whether the player was on offense or defense.

Results. There were 81 total injuries, of which 66 (81%) were acute and 15 (19%) were overuse. Of the acute injuries, 11 were severe and 55 were minor. The overall injury rate was .057 injuries per 100 player-hours. The severe injury rate was .008 injuries per 100 player-hours, of which 46% were ball-related injuries and 27% were collisions. The most frequent mechanism of injury was being hit by the ball, which represented 62% of the acute injuries. Of the 41 ball-related injuries, 28 (68%) occurred to players on defense. Of the 18 ball-related facial injuries, 16 occurred to players on defense.

Conclusions. 1) Little League baseball is a safe activity with a low injury rate and a particularly low rate of severe injury;

2) impact by the ball causes more than half the acute injuries, thus safety interventions should be directed towards decreasing these injuries, especially on defense; and

3) facemasks on batters can safely eliminate facial injuries to offensive players, but would only moderately reduce the incidence of ball-related facial injuries as most of these injuries are sustained by defensive players. *Pediatrics* 1996;98:445–448; *baseball (in injuries), child, adolescence.*

ABBREVIATIONS. CPSC, Consumer Product Safety Commission; AAP, American Academy of Pediatrics; RIF, reduced injury factor.

Baseball continues to be one of the most popular sports in the United States. Injuries in organized youth baseball occur at a small, but not insignificant rate, and have been the subject of inquiry by several groups including the Consumer Product Safety Commission (CPSC),[1-3] the American Academy of Pediatrics (AAP),[4] and Little League Baseball, Inc.[5] Previous studies generally indicate that 2% to 8% of players are injured per season in organized youth baseball,[4] with most of the injuries being minor. The CPSC reported 164 800 baseball-related injuries during 1993 to children ages 5 to 14. Of these injuries 76 000 (46%) were head or facial injuries.[3]

National organizations, including the AAP, the American Dental Association, and the Society to Prevent Blindness, have made safety equipment recommendations designed to reduce injuries. Some of these recommendations are not generally accepted by organized youth baseball, in particular, the use of face protection for batters and the use of a reduced impact baseball (*Wall Street Journal*, May 24, 1994:B2).

We present data from an injury survey of two Little League baseball organizations involving over 2800 players for the 1994 season with the goal of identifying interventions likely to be effective in reducing injuries. Special focus was placed on injuries of the head and face in an effort to identify injury patterns and the potential value of proposed safety equipment. Unlike previous studies that obtained injury data from medical insurance reports or hospital emergency department visits, we obtained data by direct interview of the managers of virtually all teams in the organizations studied for an entire season.

MATERIALS AND METHODS

The setting for our study was two local Little League Baseball organizations in suburban Rochester, New York. The leagues were of comparable size and, combined, included over 2800 participants, ages 7 to 18. Both leagues had a softball program that was for girls only. Although the hardball programs were co-ed, there were no girls over age 12 participating.

In one league, the hardball players ages 9 to 12 were required, while at bat or running bases, to wear a batting helmet equipped with a wire mesh face guard (see Fig 1). All other players in both leagues, when at bat or on base, wore a standard batting helmet with double earflaps without a face guard (see Fig. 2.) Further, in one league, the 8-year-old group played with a reduced impact baseball manufactured by Worth, Inc called RIF #5.

At the beginning of the 1994 baseball season, an injury reporting survey form was given to the manager of each team. The survey form requested demographic and injury information. The demographic information included: type of ball (hardball, softball, or RIF), number of players on team, age range, number of games in season, number of hours of practices per week, and whether or not there were face masks on the batter's helmet. The managers were asked to report all injuries that satisfied any of the following criteria:

1) required missing a game;
2) required evaluation by a physician or dentist; or
3) caused an inability to play a certain position (ie, throwing injury: no pitching)

From the Departments of *Emergency Medicine, ‡Orthopedics, and §Pediatrics, University of Rochester School of Medicine & Dentistry, Rochester, New York.

Received for publication Jan 22, 1996; accepted Mar 29, 1996.

Reprint requests to (J.S.P.) Department of Emergency Medicine, University of Rochester Medical Center, 601 Elmwood Avenue, Rochester, NY 14642.

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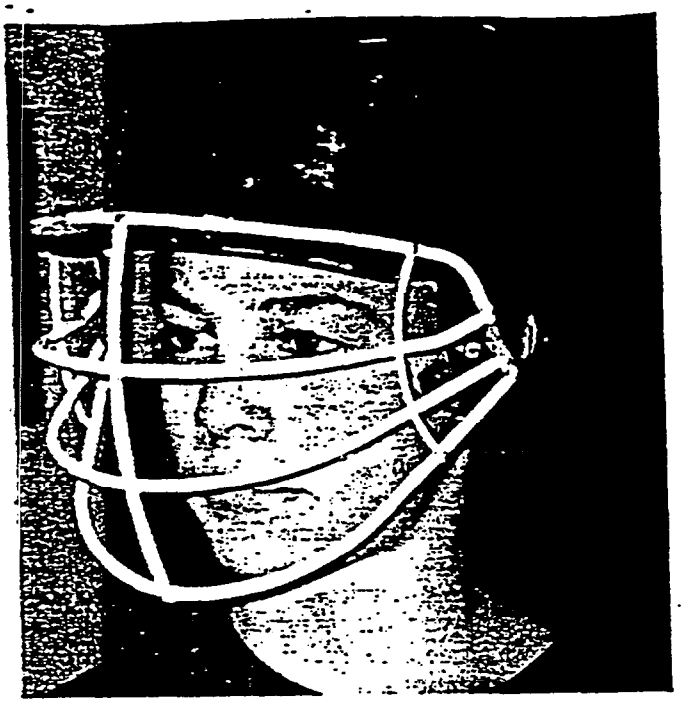

Fig 1. Batting helmet with earflaps and wire facemask.

Fig 2. Batting helmet with earflaps but no facemask.

For each injury, the managers reported the player's name, age, how long the player was out of action, a description of how the injury occurred, what was injured, and the treatment.

At the end of the season, each manager was called by one of the authors and a report of the injury survey data was taken on the telephone. If additional injury information was needed, one of the authors directly contacted the parent or the physician of the injured child.

Injuries were categorized as acute injuries or overuse syndromes. The acute injuries were classified as either:

a. catastrophic—death, permanent central nervous system dysfunction, loss of vision, loss of limb;
b. severe—more than 1 month lost time or permanent disability; or
c. minor—less than 1 month lost time and no permanent disability.

Further, the acute injuries were categorized by mechanism of injury, and by body area injured. The following mechanisms were considered: sliding, running not sliding, collisions, ball injuries, and bat injuries. The ball injuries were further subdivided into injuries on offense (occurred to a batter or a base runner) and injuries on defense (occurred to infielders, outfielders, or players warming up). Injury rates were calculated[9] as injuries per 100 player-hours as follows:

1 player-hour = 1 hour of practice or game by 1 participant
injury rate per 100 player-hours = (number of injuries/total player-hours)* 100

We assumed that a game took 2.5 hours and that 90% of players were in attendance at games and 75% were in attendance at practices. This assumption was based on information derived by the manager interviews and by direct author observation.

The data was analyzed for statistical significance using a multinominal model for injury counts. The *P* values for statistical significance were calculated by summing all the one-sided exact binomial *P* values, and multiplying by the number of multinominal categories to correct for selection of the hypothesis posthoc, based on the data.

RESULTS

We received injury information from 226 of 230 managers (98%) representing 2861 players, participating for 140 932 player-hours. There were 105 286 player-hours of hardball, and 35 646 player-hours of softball.

There were no catastrophic injuries. There were 66 acute injuries (50 hardball, 16 softball) and 15 overuse injuries (11 hardball, 4 softball). Of the 66 acute injuries, 11 (8 hardball, 3 softball) were classified as severe. These severe injuries included a tear of the medial meniscus of a knee, two injuries to permanent teeth, and eight fractures. The fractures classified as severe were of the femur, tibia, ankle, clavicle, thumb metacarpal, thumb proximal phalanx, index finger, and nose. The minor injuries included 27 contusions, 12 sprains, 4 fractures, 4 lacerations, 3 dental injuries, 2 closed head injuries, 2 abrasions, and 1 muscle strain.

Over the course of one season, 2.3% of the players sustained an acute injury. The acute injury rate was .057 injuries per 100 player-hours, and the severe injury rate was .008 injuries per 100 player-hours.

The acute injuries were categorized by mechanism of injury (Table 1) and by body area injured (Table 2). The data in Table 3 illustrates that ball-related injuries occurred more frequently than any other mechanism ($P = .0004$). Of the 41 ball related injuries, 28

TABLE 1. Injury Counts by Mechanism of Injury

Mechanism of Injury	Severe	Minor	Total
Running-sliding	1	5	6
Running nonsliding	1	6	7
Collision-player	3	3	6
Collision-object	1	1	2
Ball-offense	1	10	11
Ball-defense	4	24	28
Ball-other	0	2	2
Bat-thrown	0	0	0
Bat-not thrown	0	3	3
Other	0	1	1

TABLE 2. Injury Counts by Body Area Injured

Body Area Injured	Severe	Minor	Total
Hip/pelvis	0	1	1
Knee	2	7	9
Ankle/foot	1	5	6
Leg, not near joint	1	2	3
Shoulder	1	1	2
Elbow	0	3	3
Wrist/forearm	0	5	5
Hand/finger	3	11	14
Back	0	1	1
Head	0	3	3
Neck	0	0	0
Facial (dental)	2	2	4
Facial (not dental)	1	13	14
Chest	0	1	1

(68%) occurred to players on defense, 11 (27%) to players on offense, and 2 (5%) to players sitting on the bench.

Focusing on head and facial injuries, we found that 18 of 21 (86%) were caused by the impact of the ball. Of the 18 head and facial injuries caused by the ball, 2 were severe injuries (1 offense/1 defense), and 16 were minor injuries (1 offense/15 defense). A significantly greater number of ball-related facial injuries occurred on defense than on offense (16 versus 2; $P = .0013$). Defensive injuries occurred most frequently in the infield: 9 infield, 2 outfield, and 5 warm-ups ($P = .0654$).

There were 21 486 player-hours in the 9- to 12-year-old hardball group where the batting helmet with face mask was required. There were 4 ball-related facial injuries in this group, all of which occurred on defense. There were no reported problems with compliance in using face masks, and there were no injuries attributable to face masks. There were 39 522 player-hours in the 9- to 12-year-old hardball where the helmet did not have a face mask. This group had 3 ball-related facial injuries (2 on defense and 1 on offense).

With regard to the reduced impact ball, there were 6855 player-hours by 8-year-olds playing with the reduced impact ball. There was only 1 ball-related injury in this group, a minor thumb contusion. In the remaining group of 7- and 8-year-olds playing with a regular baseball, there were 15 779 player-hours and 2 ball-related injuries including a subluxed tooth and a fractured thumb.

DISCUSSION

Injuries in organized baseball are classified as catastrophic, severe, and minor. By all accounts the minor injuries predominate, with rare severe injuries and very rare catastrophic injury.[1–4]

In our survey we identified no catastrophic injuries. From 1983 to 1993, the CPSC reported 35 deaths from playing baseball for children ages 5 to 14.[3] The deaths were mostly from the impact of the ball either to the head or the chest. During 1983 there were an estimated 11 500 000 to 13 600 000 children playing organized baseball.[1] Thus, the occurrence of a fatality is very rare, on average, less than 1 per year for every 3 000 000 participants. This study is unlikely to shed any light on the incidence of fatalities.

TABLE 3. Summary for Mechanism of Injury

Mechanism	Injury Count	Percent
Running	13	19.7
Collision	8	12.1
Ball	41	62.1
Bat	3	4.5
Other	1	1.5

In our survey we identified a predominance of minor injuries and infrequent severe injuries. Our occurrence rate of 2.3 injuries per 100 players per season is on the low end of previously reported series.[2] Similar to our study, the CPSC found that impact of the ball was the most frequent mechanism of injury. They estimated that 45% of injuries resulted from being hit by the ball. This compares with 62% of the acute injuries in our series. Focusing our attention on head and facial injuries we noted that 86% were ball-related. Therefore, it seems logical that interventions and protective equipment should be directed towards reducing the incidence of ball-related trauma especially to the head and face.

With this theme in mind, the AAP has recently reviewed the risk of injury to children 5 to 14 years of age in organized baseball and has made injury prevention recommendations.[4] Furthermore, the American Dental Association supports mandatory use of oral/facial protection in youth sports,[6] and, the National Society to Prevent Blindness specifically recommends the use of face masks on batting helmets.[8,10]

There is a mixed reaction from coaches and parents to the mandatory use of the face mask or eye protection for batters. In the leagues we surveyed, some adults voiced the concern that the face mask might restrict vision, making it more likely that a batter would be hit by a pitch or otherwise be hurt while running. Also, as pointed out by the CPSC[1,3] there is a theoretical risk that head and face protection can place more stress on the neck.

Our data is helpful in understanding the overall patterns of injury and the effect of possible rule and equipment changes that have been suggested. We noted the following:

1) The majority of head and facial injuries caused by the ball occurred on defense, and thus would not be prevented by the face mask on the batting helmet.
2) No injury was identified as being caused by the face mask on the helmet. If injury attributable to the face mask occurred more frequently than .013 per 100 player-hours we had greater than 95% probability of observing an injury.
3) All facial injuries that occurred on offense would have been prevented by the batting helmet with face mask, but not by a helmet with only eye guards.

86

To estimate the reduction in facial injuries that could be expected if face masks were mandated on the batting helmets, we note that in the pool of participants playing without face masks 2 of 14 facial injuries were on offense. Thus, 14% of the injuries

could have been prevented. It follows that the mandatory use of face masks on batting helmets would not have prevented 86% of the facial injuries caused by the ball. Nelson et al[7] reported on 26 eye injuries from baseball seen at an urban eye emergency department in 1 year. The player population base was not reported, so we cannot infer any incidence. However, they do report that 37% of these eye injuries occurred while at bat. Thus, perhaps as many as 63% of eye injuries would not be prevented by face masks on the batting helmet. On the other hand, in a prior study at the same hospital, Grin[8] reported on eye injuries serious enough to require admission to the hospital. In a 3-year period, there were 10 baseball injuries requiring hospital admission, 7 of which occurred to children who were at bat. Thus, it is possible that the facial injuries occurring on offense may represent a disproportionate number of the severe, and even catastrophic, injuries.

Regarding the reduced impact baseball, we look forward to gathering more data so that we can estimate what effect these balls will have on injury rates. However, our data shows that 62% of all injuries and 85% of facial injuries are caused by the ball. Therefore, if an acceptable reduced impact ball were developed, it could potentially significantly reduce the rates of injury in youth baseball. At this point, however, these reduced impact balls have not been shown to reduce catastrophic or serious injuries.

Finally, this study is a more accurate representation of injury incidence and severity in Little League baseball because of the way the data were obtained. We collected our injury data in a manner different from the CPSC[1–3] and from the method used by Hale.[5] Hale used physician reports to the accident insurance company. The CPSC uses surveillance of emergency department visits to identify injuries and uses national data such as from the Sporting Goods Manufacturers Association to estimate players at risk. We obtained injury information on every child playing in the local leagues. We reported our data as injuries per 100 player-hours, and thus our data can be compared with other leagues with different numbers of players and lengths of season. Further, we identified more injuries, as some injuries were treated by pediatricians in their offices rather than in emergency departments. It is reasonable to assume that many of the additional injuries we identified were minor.

In summary, we conclude that:

1. Little League baseball is a generally safe activity with a low injury rate;
2. The most common mechanism of injury is impact by the ball, accounting for over 60% of the injuries in this series. The majority of these injuries occur on defense (68%);
3. Face masks on batters can reduce or eliminate facial injuries to offensive players, but would only moderately reduce the incidence of ball-related facial injuries as most of these injuries are sustained by defensive players; and
4. Further surveillance is indicated as the severe injury rate is quite low and thus a larger number of player-hours is required to produce a large sample of severe injuries. For example, it is possible that a disproportionate number of severe facial injuries occur to offensive players even though most facial injuries occur to defensive players.

ACKNOWLEDGMENTS

The authors wish to acknowledge the effort and support of the administrators and team managers of Pittsford Little League Baseball and Fairport Little League Baseball. We also wish to thank the Department of Biostatistics, University of Rochester School of Medicine & Dentistry, for help with the statistical analysis of the data.

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News Release

Contact: Carolyn Kolbaba, 847/981-7945
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For Release: September 10, 1996
5 PM (ET)

Below are highlights of studies published in the September issue of Pediatrics, the peer-reviewed, scientific journal of the American Academy of Pediatrics (AAP). The full text of these studies and interview contact information may be obtained through the AAP Division of Public Relations.

SUBURBAN CHILDREN NO STRANGERS TO VIOLENCE

CHICAGO—Suburban children encounter a "surprising" amount of violence, according to a study published in September's *Pediatrics*. Researchers from the University of Pennsylvania School of Medicine in Philadelphia compared the amount and effect of violence experienced by inner city and suburban sixth graders. Of the 228 suburban children surveyed, 82 percent either knew someone, witnessed or were themselves the victims of a robbery, beating, stabbing, shooting or murder. The 209 inner city children surveyed reported an even higher exposure rate (97 percent). Contrary to consumer media reports, children do not become indifferent after repeated exposures to violence, the researchers say. "No matter where children live, once they are exposed to violence they have many reactive feelings and a strong need to talk about violent events," the researchers say. "More emotional support is needed for all children exposed to violence," the researchers conclude.

HEPATITIS B VACCINATION IN SCHOOLS OKAY WITH MOST PARENTS

CHICAGO—A new study finds that a majority of parents approve of school-based vaccination against hepatitis B virus (HBV), an infection that results in 4,000 to 5,000 U.S. deaths annually. "In the United States, hepatitis B is largely a sexually transmitted disease, with the largest number of cases occurring in persons 15 to 39 years of age," say researchers from the Centers for Disease Control and Prevention (CDC). They surveyed parents of seventh-graders to learn more about their attitudes and beliefs on hepatitis B vaccination in school clinics. Of the 316 parents that returned questionnaires, 80 percent thought schools were a good place to immunize children. Parents whose children were vaccinated in school favored the convenience of school-based immunization, the lack of cost and the use of needle-less injection methods. Eighty-five percent of parents who refused vaccination said they refused because their child was already vaccinated: only 13 percent of these parents objected to school-based vaccination. "Because of the difficulties in reaching this population in traditional health care settings, school-based vaccination should be considered for vaccines targeted at this age group," the authors conclude.

CHILD ABUSE REPORTING IMPROVEMENTS

CHICAGO—Give pediatricians a structured form to follow when examining child abuse victims, and you'll get much more complete information for medical, social, and legal purposes. Those are the findings of a new study authored by pediatricians from Children's Medical Center in Richmond, Virginia. The authors looked at 567 children evaluated for physical or sexual abuse over a two-year period, and compared outcomes using structured and unstructured forms. The structured forms increased identification of the abuser from 56 percent to 95 percent, documentation of requests for photographs from 18 percent to 98 percent and drawings of physical findings from 17 percent to 87 percent. The authors say these medical records serve as legal documents and are often the source of information for Child Protective Services, law enforcement and the judicial system. "We are convinced that standardized structured clinical forms improve both the quality and quantity of information collected and documented during an encounter with a patient," the study's authors say.

—OVER—

PEDIATRICS STUDIES
2-2-2

DEFENSIVE PLAY POSES SAFETY RISKS FOR LITTLE LEAGUERS

CHICAGO—Little Leaguers may be safer at home plate than in the field, a study in *Pediatrics* reports. A study conducted by researchers at University of Rochester School of Medicine and Dentistry, Rochester, N.Y., discovered that 86 percent of the injuries were experienced by defense players who were hit by the ball. Most of the injuries caused by ball impact were to the head and face. Therefore, facemasks worn by batters would eliminate some injuries but not the majority of injuries which occur primarily to defense players, the study's authors report. The researchers also discovered that Little League is a safe sport with a low injury rate. Nearly 2,900 Little League baseball players, ranging from 7- to 18-years-old, were studied for nearly 141,000 playing hours. During this time period, there were only 81 injuries that required medical or dental care, caused a player to miss a game or prevented a player from playing a certain position. The study's authors note that more than 80 percent of the 81 injuries reported in the study were acute (catastrophic, severe or minor) and 19 percent were due to overuse. However, the acute injuries were predominately minor. *Editor's Note: The American Academy of Pediatrics says consideration should be given to using low-impact baseballs and softballs approved by the National Operating Committee on Standards for Athletic Equipment for children 5 to 14 years old.*

BED-WETTING LINKED TO BEHAVIOR PROBLEMS

CHICAGO—Bed-wetting may signal behavior problems in children, a study in *Pediatrics* reports. Researchers at the University of Rochester School of Medicine and Dentistry, Rochester General Hospital and Genesee Hospital, Rochester, N.Y., studied the Child Health Supplement of the 1981 National Health Interview Survey to determine the relationship between the frequency of bed-wetting and behavior problems. The survey included a 32-item Behavioral Problem Index (BPI), which the study's authors used to determine behavior problems. Children scoring greater than the 90th percentile on the BPI were more likely to lie, bully other children, misbehave and lack concentration, among other behavior problems. Out of 10,960 5- to 17-year-olds included in the entire survey, bed-wetting affected 33 percent of 5-year-olds, 18 percent of 8-year-olds, 7 percent of 11-year-olds and less than 1 percent of 17-year-olds in the survey. "Bed-wetting in children aged 5 years and older, irrespective of its frequency, is associated with increased rates of behavior problems," the authors conclude. Besides behavior problems, factors contributing to frequent and infrequent bed-wetting included male gender, single-parent homes and thumb sucking.

EXERCISE INTENSITY AFFECTS "BAD CHOLESTEROL"

CHICAGO—When it comes to lowering children's "bad cholesterol," exercising harder may actually be smarter, a new study suggests. Authors from New England Medical Center, Boston, Massachusetts Institute of Technology, Cambridge, and Tufts University, Boston, examined 49 8- to 11-year-old girls to examine the association between physical activity and cardiovascular risk factors. The report suggested that exercise intensity rather than the total calories spent on physical activity may decrease the risk of heart disease through its effect on low-density liproprotein cholesterol (LDL-C). The authors said the study, which is the first of its kind, suggests that even moderately intense exercise may reduce the risk of developing heart disease. Risk factors for heart disease include a high LDL-C level, low high-density lipoprotein cholesterol (HDL-C) level and high blood pressure. And preventing heart disease should begin during childhood, the authors say.

9/1 —30—

EDITOR'S NOTE: These studies were published in the peer-reviewed, scientific journal of the American Academy of Pediatrics, but do not necessarily reflect the policies or opinions of the Academy. The American Academy of Pediatrics is an organization of 50,000 pediatricians dedicated to the health, safety and well-being of infants, children, adolescents and young adults.

Dedicated to Amateur Baseball from Coast-to-Coast
Founded 1935

AMERICAN AMATEUR BASEBALL CONGRESS

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Pee Wee Reese Division (12 and Under)
Willie Mays Division (10 and Under)
Roberto Clemente Division (8 and Under)

September 24, 1996

Ms. Susan B. Kyle, Ph.D.
Project Manager
Sports and Recreation
U.S. Consumer Product Safety Commission
Washington, DC 20207

Dear Ms. Kyle:

This communication is designed to produce comments concerning the notice of August 23 regarding the petition to require face guards on youth baseball batting helmets.

The American Amateur Baseball Congress is a very safety conscious organization. We have had a strong emphasis on improving coaching instruction for coaches along with instruction for players. We have also continued to participate with meetings of CPSC, U.S. Baseball Seminars and individual meetings with other amateur baseball organizations.

We are very familiar with the CPSC injury study report and are the leading amateur baseball organization in not only suggesting the "RIF" baseball for all play in our lower ages (12 and under), but requiring that the baseball be used at all regional and world series games in those age divisions. The "RIF" baseball has been required at the world series for the past three years and at the regional level for the last two.

Discussion within our Board of Directors has also taken place regarding face guards and impact bases. Before any additional action is taken regarding face guards it is our suggestion that attention be focused upon the following:

1. Will the face guard change how the game of baseball is played?

2. The current concern of sizing and sanitation of existing helmets which could be intensified by the addition of the guard.

3. Is this cost prohibitive and will it limit the number of participants?

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4. It is essential that all manufacturers who produce these products address this need and then have the product field tested at the grass roots level.

5. Do guards inhibit eye sight in relationship to the ball?

6. Will serious injuries result in sliding if the guard forces the back of the helmet to cause undue severity of pressure on the spinal column?

7. Should there be more instruction on how to avoid being hit by a pitched ball?

8. Does the organization who currently requires the use of the face guard have substantiated injury factor information? Do they have a comparable comparison using a control group?

9. Any regulation should consider thorough field testing by several independent groups.

10. What criteria was used in the "age fifteen and younger" determination?

AABC Summary Data:

1. In 1996, the AABC had 13,751 teams with 5,639 in the three 12 and under age groups. This is an approximate total of 112,780 persons.

2. Our insurance company is considering some rate reductions because of positive steps in safety taken by the AABC.

3. We strongly encourage real efforts at the grass roots to determine the feasibility and practical function of any face guard required standards.

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4. The AABC, Babe Ruth, Little League, Pony, NABF and Dixie baseball groups meet at least 2-3 times annually and would encourage any dialogue that may be helpful. I chair this group and volunteer this procedure.

We wish to cooperate with your group any way possible to improve safety conditions for players involved in our national pastime.

Truly Yours,

Joseph R. Cooper
President

F

United States
CONSUMER PRODUCT SAFETY COMMISSION
Washington, D.C. 20207

MEMORANDUM

DATE: November 14, 1996

TO : Susan B. Kyle, Ph.D., Project Manager,
Directorate for Epidemiology and Health Sciences

Through: Warren J. Prunella, Associate Executive Director,
Directorate for Economic Analysis

FROM : Elizabeth W. Leland, Economist,
Directorate for Economic Analysis

SUBJECT: Economic Effects Associated with the Use of Batting Helmets with Face Guards by Youth Baseball Players

I. Introduction

This memorandum provides information to be used in consideration of petition HP 95-1 from the American Academy of Facial Plastic and Reconstructive Surgery. The petition requests that the Consumer Product Safety Commission (CPSC) adopt a standard requiring that protective batting helmets manufactured for use by children under the age of 15 years be equipped with a face guard. Included in this memorandum is information about: current usage of batting helmets with face guards; the rate and cost of injury associated with ball impact to the face; the potential costs and benefits associated with the use of face guards.

II. Costs of Injury and Death from Ball Impact to the Face

In 1995, an estimated 9,670 medically-attended injuries (i.e., emergency-room-treated injuries as well as injuries treated in other medical settings) resulted from ball impact to the face of batters during organized play on youth baseball teams.[1] Of these, an estimated 3,868 injuries were treated at hospital emergency rooms. In 1995, there were no deaths

[1]The estimate for medically-attended injuries is based on information which indicates that emergency room-treated injuries generally are about 40 percent of medically-attended injuries.

associated with ball impact to the face during organized play on youth baseball teams.[2]

In 1995, according to the CPSC Injury Cost Model, the total cost of the facial ball-impact injuries treated in hospital emergency rooms was $14.3 million, with an average cost per injury of about $3,700. The estimated cost of all medically-treated injuries resulting from ball impact to the face was $35.8 million.

III. Risk of Injury to Batters

As noted in a previous memorandum from the Directorate for Economic Analysis (EC), rather than requiring each member of a team to purchase a batting helmet, a team usually will purchase several batting helmets in various sizes for shared use among team members[3]. According to batting helmet manufacturers and youth baseball and softball league representatives, most teams generally keep on hand fewer than ten batting helmets for use during a season's play. Little League teams, for example, are required to keep seven batting helmets for each team.

Available information indicates that there are an estimated 5.6 to 6.0 million players (average of 5.8 million) in organized baseball and softball leagues. Therefore, the estimated risk of incurring a medically-treated injury is on the order of 1,600 to 1,700 per million players. Since team size in organized youth leagues ranges from 12 to 20 players, there are an estimated 280,000 to 500,000 organized teams. If we assume that each team uses 7 batting helmets, there may be from 2.0 to 3.5 million batting helmets, with and without face guards, in use. The risk of incurring a medically-treated injury may also be expressed as from 3,000 to 5,000 per million batting helmets in use (or, an average of 0.004 per helmet).

There are no readily available data regarding the proportion of helmets in use with face guards today. Based on other information, however, a rough estimate can be made. Although some organized youth baseball leagues recommend the use of face guards for batting helmets, EC identified only one that requires face guards on batting helmets. The decision to require face guards was made by Dixie Youth Baseball, Inc. (Dixie League) in

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[2]The estimate for emergency room-treated injuries and the information about deaths are reported in :"Additional Information on Baseball-Related Injury Diagnoses, Children Ages 5-14 Years Old", Memorandum from Prowpit Adler, CPSC, EHHA, to Susan B. Kyle, Ph.D., Project Manager, Sports and Recreational Hazards, CPSC, April 23, 1996.

[3]"Petition HP 95-1: Development of a Safety Standard to Require Face Guards on Protective Batting Helmets", Memorandum from Elizabeth W. Leland, EC, CPSC, to Susan B. Kyle, Ph.D., ESHF, June 15, 1995.

1992, effective with the 1995 season. In 1995, approximately 594,000 players in approximately 39,000 teams were using batting helmets with face guards. If each team had on hand 7 helmets, then the Dixie League in 1995 used approximately 273,000 helmets with face guards. If we assume that Dixie League helmets account for the most face guard use, roughly 8 to 14 percent (11 percent on average) of all batting helmets in use in 1995 were equipped with face guards.

It is possible that some players in leagues which recommend, but do not require, face guards on batting helmets, have their own helmets with face guards; however, CPSC staff believes that this number is so small that it does not significantly increase the estimated number in use of protective batting helmets with face guards. It has been observed that usage of batting helmets with face guards is "seldom" when helmets with face guards are made available, but not mandated.[4]

IV. Effectiveness of Batting Helmet Face Guards

One source of information about the effectiveness of face guards in reducing injuries can be gathered from the Dixie League experience. In 1994 (when 33 percent of the players used the batting helmet with face guard), facial injuries to batters and baserunners was 5.8 percent of total injuries. In 1995, the percent was 0.7 percent, or an 88 percent decrease from 1994. A Dixie League representative indicated that it was assumed that the face guard was 100 percent effective since there were no instances of players wearing face guards being injured from a pitched or thrown ball.[5]

Another source of information about the possible effectiveness of face guards is a CPSC Directorate for Epidemiology and Health Sciences (EH) study.[6] Information from that study indicates that 26 percent of the batters who were wearing a batting helmet with no face guard received injuries to the face area and 4 percent received injuries to the head and neck area, while those batters who were wearing a batting helmet with a face guard did not receive any injuries to the face or the head and neck area.

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[4]Mills, Stephen C., D.D.S., Academy for Sports Dentistry, Communication with Susan B. Kyle, Ph.D., Consumer Product Safety Commission, September 17, 1996.

[5]Sadler, John M., Jr., Sadler & Company, Communication to Susan B. Kyle, Ph.D., Consumer product Safety Commission, September 20, 1996.

[6]"Report on Injuries and Deaths related to Baseball (Children Ages 5-14)", Prowpit Adler, EHHA, CPSC in "Youth Baseball Protective Equipment Project Final Report", CPSC, May 1996.

V. Estimated Potential Benefits Associated with the Use of Face Guards on Batting Helmets

Based on the information above, an average of 5.8 million youth play baseball and softball in organized teams. Those teams use an average of 2.75 million batting helmets. Given that an estimated 11 percent of batting helmets are equipped with face guards, about 89 percent or 2.4 million batting helmets are not equipped with face guards.

Given the total societal cost of injuries of $35.8 million, the expected injury cost per helmet without a face guard is about $14.63 per year. Assuming a 10-year product life for batting helmets, the estimated present value of the benefits over the life of a helmet with a face guard is $119 (assuming a 5 percent discount rate and that the face guards are fully effective in preventing injuries from ball impact to the face). At a 7 and 10 percent discount rate, respectively, the estimated present value of benefits over the life of the helmet would be $110 and $99.

While the use of face guards on helmets is expected to reduce or eliminate facial injuries to batters, it also may have other consequences. These other effects can be described, but are not easily quantified. One such effect was noted by a Dixie League representative, who wrote that the league's accident insurance costs have decreased, in part as a result of the use of face guards.[7] Another offsetting effect was noted in letters to CPSC that alleged that the use of face guards would retard the batter's field of vision or would not permit access to breathing airways. Such adverse effects would entail a "cost" in the form of loss of utility.[8] These effects have not been included in this analysis.

VI. Estimated Net Benefits Associated with the Use of Face Guards on Batting Helmets

As noted earlier, face guards can be purchased separately and attached onto a helmet already in use or a helmet can be purchased new with a face guard already attached. Face guards alone carry a retail cost of about $10. If a helmet is purchased with a face guard already attached to it, the price of the helmet is increased by the cost of the face guard. Thus, using a face

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[7]Sadler, op.cit.

[8]Communication from Wiley, Rein, and Fielding on behalf of Dr. Robert W. Crow, M.D. to Susan B. Kyle, Ph.D., Consumer Product Safety Commission, July 26, 1995, and April 17, 1996, and communication from Dr. Barry Goldberg, USA Baseball, to Ms. Susan B. Kyle, Consumer Product Safety Commission, September 17, 1996).

guard, regardless of the way in which it is purchased -- alone or already on the helmet -- represents a one-time initial cost of $10 per helmet.

If batting helmets are fully effective in preventing facial injuries to the batter, then the net benefits of using face guards on batting helmets are about $90 to $100 per unit or about 10 to 11 times the cost.