

Used football faceshields are susceptible to breaking on impact

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Game-worn football faceshields are more susceptible to breaking when subjected to high-velocity impact than are new faceshields, according to recent research.

In the study, researchers used an air cannon to hurl baseballs at new and used polycarbonate faceshields. All of the new shields withstood the strongest impact tested, which was designed to match the force of a kick to the face. More than a third of the game-worn faceshields fractured in response to the testing, which included lower forces of impact as well.

In a related survey of college [football](#) equipment managers, the researchers found that 98 percent of football programs allow faceshield use, while 18 percent of the [players](#) wear a shield. Of the programs that responded, only 21 percent require the use of a faceshield in players with [poor vision](#) in one eye. Half of the respondents reported that their school had established a replacement policy for the shields.

The combination of findings led the Ohio State University scientists to recommend that intercollegiate football programs develop a policy for routine inspection and replacement of used faceshields. The researchers also said that coaches or trainers should strongly recommend that football players with poor vision in one eye wear a faceshield during all practices and games.

The most common cause of poor vision in a single eye among children and middle aged adults is a disorder called [amblyopia](#), also known as

[lazy eye](#), which affects up to 3 of every 100 children, according to the National Eye Institute. Because the disorder originates in the area of the brain that controls vision, loss of vision in the affected eye can become permanent if it is not treated before about age 8.

"Any football player who has a vision problem should consider wearing a faceshield," said Aaron Zimmerman, assistant professor of optometry at Ohio State and lead author of the study. "Something could happen to their good eye. Why take a chance, especially if there's a way to prevent that?"

The research is published in a recent issue of the journal *Optometry*.

This study is a follow-up to a previous Ohio State study that determined that the two most popular brands of football helmet faceshields could withstand a hit equivalent to a kick in the face and provide that protection without disrupting players' vision.

In this more recent study, the researchers sought to determine how the faceshields performed after the rigors of standard football action, as well as exposure to sun or freezing temperatures. The group also sent a survey to equipment managers at 117 Division 1 Football Bowl Subdivision programs in the National Collegiate Athletic Association. Fifty-nine managers responded – a 50-percent response rate.

In the tests of structural integrity, a baseball was used to mimic the hardness and curvature of the toe end of a cleat or a fist. The scientists tested the two most popular collegiate and professional football helmet faceshields by manufacturers Oakley, based in Foothills Ranch, Calif., and Nike, based in Beaverton, Oregon. The average cost is \$45 to \$50 per shield.

Using game-worn shields donated by two football programs, the

researchers tested their impact resistance at five velocities ranging from almost 150 miles per hour to 116 miles per hour. The highest velocity equated to an impact force of about 2,500 Newtons, or 562 pounds of force – comparable to the force generated by an adult soccer player kicking a ball. The lowest velocity equated to an impact force of about 1,933 Newtons, or almost 435 pounds of force.

For this impact study, the scientists randomly assigned groups of the donated used shields to each of the velocity levels. At the highest velocity, 10 faceshields fractured. Three shields broke at the middle-range velocities, and one shield broke at the lowest velocity.

Zimmerman and colleagues also subjected 24 new faceshields to sunlight for an average of 3 ½ hours per day and five days per week for 10 weeks to mimic exposure to ultraviolet radiation during a football season. Previous research has suggested that solar radiation can weaken polycarbonate. None of these shields broke when impact-tested at velocities of 150 miles per hour.

In a small sample of game-worn faceshields exposed to freezing temperatures of 14 degrees Fahrenheit for one hour, four of five used shields broke when tested at velocities of about 130 miles per hour.

Many of the shields that fractured showed the most stress on the sides, where the faceshields attach to the helmet. But a few shattered into multiple pieces that had potential to tear the retina or even penetrate the eye.

"Based on the results, we felt that multiple impacts to shields were probably the likely cause for the lower resistance to impact over time," Zimmerman said. "No matter what the cause is, you do not want to have a protective device fail and potentially cause a more severe injury."

The survey of football equipment managers confirmed for the researchers that no universal guidelines exist for inspecting and replacing faceshields to prevent such equipment failures.

Forty-one percent of the programs had established faceshield-related policies for players with poor vision in one eye: 21 percent required the use of faceshields for those players, and 20 percent recommended faceshields. Fifty percent of the programs had established replacement policies for the faceshields, and a fourth of the programs instructed players to inspect their own shields for signs of damage.

Use of the faceshields in most cases is driven by player choice, according to the survey. Fifty-two percent of programs approve the use of a faceshield if a player asks for one. The rest of the programs require approval from a trainer, coach or team physician.

The main reason players ask for faceshields, according to the survey: About half of the players want to wear them because the shields look good and resemble the equipment worn by professional football players. More than a third use the faceshields for general protection, 11 percent are protecting their eyes from a repeat injury, and 1.5 percent of players have good vision in only one eye.

About 70 percent of programs issue new faceshields at the start of a season. A little over half of the programs replace faceshields that show a small scratch or crack, and about one-third replace faceshields only if the scratch or crack is considered substantial. Ten percent of the programs replace faceshields only when the player's vision is impaired by a damaged shield. One manager reported that players receive a new faceshield for every game.

Faceshields have been recommended for younger football players for more than a decade. The sports safety committees of the American

Academy of Pediatrics and the American Academy of Ophthalmology issued a report in 1996 recommending that football helmets be equipped with a polycarbonate faceshield for face and eye protection. They were responding to a 1993 report by Prevent Blindness America indicating that football was the fifth-greatest contributor to sports-related eye injuries in patients younger than 25.

"We feel that each institution should have some sort of similar policy," Zimmerman said. "Once a week the shields should be inspected, particularly where they fasten to the helmet. But players should be encouraged to glance a faceshield over before each practice and game. And if there's a deep scratch or crack present, it definitely needs to be replaced."

Provided by The Ohio State University

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