

Imagine a record player turned on its side, letters and numbers fastened with Velcro to the flat spinning edge of the disk. You stand six to 10 feet away and have to call out the letters as they fly by.

Student-athletes at the U.S. Air Force Academy don't have to imagine. This dynamic visual training exercise is part of a vision training program credited with helping Falcon athletes perform better in many sports.

"We can't say that by doing sports-vision training your batting average is going to go up by .2 points or anything like that," says Lt. Col. Mike Zupan, PhD, Director of the U.S. Air Force Academy's Human Performance Laboratory. "But we know the athletes are getting quicker in the lab, their eyes are responding better, and they've got better eye-hand coordination, quicker reflexes, and better peripheral vision. So we're saying that it is helping them; we don't know how much."

Can your athletes benefit from vision training? Chances are they already do, in some fashion. Any hand-eye coordination drill is, in a sense, vision training. Many elite-level programs have used vision training for years, especially in baseball (it was part of the famous Kansas City Royals baseball school that helped the franchise to its late-1970s heyday). But in just the past five years or so, a plethora of new products and services have hit the market, and many performance specialists and coaches believe it's a great way to help their athletes reach their potential.

And it's more than baseball and softball. Athletes in other hand-eye sports, such as basketball, volleyball, and tennis, are the most obvious beneficiaries, but some schools have athletes in certain positions—such as football quarterbacks, receivers, and defensive backs, or goalkeepers in ball and puck sports—practicing vision training. Even linemen are doing the drills, and some experts say it can benefit athletes in surprising sports, such as swimming, skiing, and track and field. At Air Force, hurdlers seem to be benefitting, Zupan says. "The coach is amazed by how much better they're able to pick up the hurdles and make adjustments when they hit them."

More than 20/20

When talk arises about improving vision, the first and natural reaction might be: "Well, I have some nearsighted players, but they have corrective lenses, so what's the problem?" But there's more to seeing well in sports than acing the eye chart on the wall.

"[The concept of] 20/20 was developed in 1853 and that's just where it belongs," says Sue Lowe, DO, an optometrist in Laramie, Wyo., and chair of the American Optometric Association's Sports Vision Section. Lowe adds

that while marketing campaigns for sports vision-training products are new, the field dates back at least 75 years.

"It's all based upon the fact that vision is learned, just like walking and talking," Lowe says. "And because vision is learned, it's something that can be rehabilitated. If a person has a stroke and sees double, we can teach them to see single again. If a person has a head injury and loses half their vision, we can teach them what to do with what they have instead of letting them flounder around on their own." Similarly, vision training may benefit athletes who have unexplained performance problems.

Vision training has its skeptics, however. The biggest complain is that the effectiveness of vision training for athletes who are not sight-impaired has not been scientifically validated, says Kuldev Singh, MD, Associate Professor of Ophthalmology at Stanford University and media spokesperson for the American Academy of Ophthalmology. "I'm not aware of any scientific evidence conclusively showing any benefit of vision training," Singh says.

Proponents say that proof is hard to come by because sports outcomes are affected by too many uncontrollable variables. Differences in physical strength, quality and quantity of practice, innate ability, experience, and outside conditions, such as weather and opponents, can easily sway any studies.

Athletes themselves say vision training helps, says Barry Seiller, MD, owner of Seiller's Visual Fitness Institute in Chicago (developer of some of the first vision training programs for Olympic athletes) and the director of the sports-vision program at Georgia Tech. Seiller says 77 percent of the athletes who went through the Georgia Tech program reported it helped their athletic performance, and 83 percent said it helped their academic performance. "That's not unusual because many of the techniques we use were originally developed for kids with learning disorders," Seiller says.

Zupan acknowledges the lack of hard, study-based validation of sports vision training. But at the Air Force Academy, he says, the athletes who do the best on vision-training skill evaluations are generally among the highest-performing athletes in their sports. He adds that a program properly followed can improve those same skills. It's not unreasonable, then, to believe vision training will lead to improved sports performance.

"We can't say through vision evaluation, 'This is going to be your best player,' because there are so many other factors involved," Zupan says. "But we show the coaches who is better with their eyes, and if that person has greater potential on the field or is already the best player, they

agree with us. They say, 'Yeah, he sees things that other guys don't.'"

Fernando Montes, formerly the Strength and Conditioning Coach for the Cleveland Indians and now with the Texas Rangers, says, at the very least, vision training skills can be bettered. "In testing, we can see that their eyes have improved in tracking and flexibility," Montes says. "Can we monitor their improvement on the computer programs, their visual memory skills and their tracking skills? Yes, we can monitor that."

For Zupan, performance suggests vision training is paying off. In addition to the hurdlers, he says the Falcons' water polo goalie became nearly unstoppable after an off-season of vision training, and the baseball team has been among the NCAA Division I leaders in team batting average.

"We have 4,000 total students and we're competing against schools that have around 29,000 students and can recruit better athletes. But our athletes work hard, and if the coaches find something that's going to help them, they'll use it."

Check-in with a Check-up

Probably the first step in establishing a vision training program is to get athletes' vision evaluated by an optometrist with a background in sports vision training. Even though the components of vision are related, testing sets them apart, so that a program can be designed to work areas that are weak, says Seiller. The exam will also create a baseline from which a vision therapy or enhancement program can be built.

Tory Lindley, MA, ATC/L, Director of Sports Medicine at Northwestern University, says a recently implemented vision-training evaluation has already been valuable to his football and baseball players. "It's steered us to look at individual needs as opposed to group needs. Especially in baseball, we've gotten more individualized," he says.

Many aspects of visual performance are interrelated, Lowe suggests thinking of the components in a pyramid. At the base is eye health, including structural integrity and basic neurological function. If those are okay, there's good input into the system. The next step consists of how well the eyes function—depth perception, eye flexibility, fusing what each eye sees into one image, focusing precision and quickness, the ability to fixate on an object and to follow it if it's moving. Finally, there's how well the brain puts all the input together to actually see.

A thorough evaluation should start at the base of the pyramid, examining the athlete's ability to see non-moving objects. At Northwestern University, when Lindley gave his

athletes vision training evaluations, he found that some with glasses actually had faulty prescriptions.

"The evaluation found that some of our student-athletes who have correction of their vision already had glasses or contacts that were inappropriate for their needs," he says. "So, we're starting by making changes there."

At the second level of the pyramid, sports vision specialists test eye function in dynamic settings. Montes cites the example of a center fielder who has trouble adequately picking up the ball off the bat. It could be an eye flexibility issue, says Montes, with the eyes following the ball in a herky-jerky way. Exercises can increase flexibility and help the player better track the ball, he says.

Seiller also examines where an athlete's eyes point in space. "Sometimes they do not point exactly where they should," he says. "When a coach says, 'Watch the ball' and the athlete says, 'I am watching the ball,' they are watching it differently than their coach is watching it. And that's why they may be early or late—whether they're swinging at a tennis ball, taking off early on a ski jump, or putting a golf ball short or long. They perceive that critical spot, the hole, the end of the hill, whatever it may be, to be in a different position than the coach is saying it is."

The cap of the pyramid may be understood more clearly if a malfunction is considered. In a cross-eyed person, the brain has to choose from two very distinct images. If the condition is severe, the brain ignores one image and uses only the other. The same happens in less extreme cases, when the eyes don't look at one spot at the same time. The brain can compensate for that, but it may lead to poor depth perception. In baseball, for example, the result may be trouble judging a fly ball in the outfield that momentarily gets lost in the sun. In football, it may be catching a pass over the shoulder.

If there's a problem in this area, training can help, says Lowe. She likens it to military fighter pilots who can learn to judge distances at altitudes where there are few if any of the background cues that help judge distance on land. They teach themselves to judge the distance by training themselves to rely purely on how the eyes must adjust to focus on the distant object.

"With guys who do poorly on pop flies but do well with ground balls, I'd be looking at their visual system," she says. "They're not taking in the right information. We can teach them what to look for."

Planning a Program

A visual training program can be basic or detailed, high-tech or low-tech. It can focus on the off-season, the preseason, or be strictly in-season. It can be designed as an integral part of an athlete's year or be approached as a supplement or alternative to other training plans.

Zupan, however, stresses starting with general vision skills, particularly the saccadic eye movements, where the eyes move to change the point of focus from near to far, also referred to as the accommodative process. *Convergence* is moving the gaze of each eye toward each other to see objects close to or moving toward the eyes; *divergence* is moving the eyes apart to see objects farther away or moving away.

"All that is the baseline that they have to get before we start making them do more specific exercises," Zupan says. "If they don't have that basic information down and they don't process that information quicker, then they're not going to improve very fast on the more specific exercises. We always start them with the general exercises, and then as they get better we move them to the more specific exercises to fine-tune them and make them more sport-specific."

Montes uses a high-tech approach. His major-league players have access to a state-of-the-art computerized facility nearly identical to that at Seiller's Visual Fitness Institute. Athletes sit down with a computer-game joy stick in hand and are taken through a series of drills that work on the main visual skills, their scores recorded each time to show progress or the lack of it. Typically, images flash on a computer screen, and the athlete must react with a joystick or keyboard directional arrows.

But Montes has taken the drills further in hopes of making them more realistic and sport-specific. As athletes advance, he has them leave their chairs and hop on a special saccadic balance board, then get into a hitting or fielding stance.

"It's a big square board and it has four electrical contact points, one on each side," Montes says. "And as you stay on top of it, you get in a balanced position and then as the light turns you have to move or react the balance board to that side to trigger the mechanism, and then it goes back and forth. It gives us an actual read-out of how well you pick up a visual stimulus, get it to your brain, down to your lower half, and react to it."

But training need not be high-tech. Many sport coaches, especially in baseball, have developed their own visual training equipment and drills. Frostburg State University baseball players toss around what look like 1960s Hula Hoops with spinning plastic balls of various colors attached,

trying to catch them by the ball of a specific color, says Head Baseball Coach Chris McKnight.

In another drill, players take batting practice with hard-plastic bats that have a flat hitting surface and a hole cut in the middle. The aim is to swing perfectly and make the ball go through the hole—that is, to make contact by not making contact.

Ricky Davis, CSCS, Head Baseball Coach and Assistant Strength and Conditioning Coach at the Lovett School in Atlanta, has a mix of low-tech and computer-based vision training drills. In one, players perform soft-toss drills to a strobe light to build concentration and tachistoscopic vision—the ability to perceive something seen for only a split-second. Davis has worked players up from soft-toss to pitching to them from 45 feet away in the strobe light. Other drills involve hitting tiny balls with broomstick-diameter bats, colored-ball drills in which players must identify which color patch they made contact with, and pitching machines with balls of varying colors, each requiring the batter to do something different with the pitch in a split second.

Davis also uses VizualEdge, a sort of home version of the system used by Montes and developed by Seiller. It consists of proprietary software that takes users through a series of vision evaluations and drills. "It takes your eyes out of alignment and you've got to force them back into focus," says Davis. "I hear them saying, 'Dang it, I lost it,' then, 'I got it again.'" It also comes with a Brock String, a 10-foot string with beads of three colors that is used to practice change of focus-point.

During the preseason this year, Davis had baseball players perform the VizualEdge drills while on a balance board. The idea was to make the work more realistic and sport-specific, he says. "You're trying to see and react and at the same time maintain your balance," Davis says. "Isn't that what you do in sports?"

"Vision, concentration, and focus—they all go hand-in-hand," Davis continues. "And balance training helps. If you lose balance, you lose focus. If you lose focus, you lose balance."

Specific schedules and progressions for vision training drills vary among the proprietary computer-based programs, but most experts recommend at least 15 minutes a day two or three days a week. Zupan says Air Force athletes aim for three days a week, doing 10 exercises each session. As they're learning, the sessions take 30 to 35 minutes, but once they become familiar with the exercises, many cut it down to 20 minutes.

"If you start vision training," Zupan says, "the first two weeks you're going to have very tired eyes and some

headaches. It's just like when you go into the weight room for the first lift of the year and your arms and legs are sore afterward because you're getting back into shape. It's the same with the eyes. When you walk out and your eyes are really hurting, you know you're getting maximum benefit from that training session."

Montes recommends training three times a week. Rangers players have the software on CDs that they can use on the road or at home. "The program is so simple that you can spend 15 minutes every day on it and make great improvements," he says. "But if you spend 15 minutes once a month, you'll make no improvement. It's a skill, and you can get better at it if you are willing to put the time in."

No one is suggesting vision training can compensate for shortcomings in overall conditioning, strength, or sport-specific skills. Instead, it's another service to offer athletes in their quest for excellence.

"I think of it as something in my toolbox," says Montes. "I work from head to toe, I work my balance, I work my nutrition, I work my conditioning, I work my strength. Now I have a tool to train a player's visual tracking capability and concentration."

Adds Lindley: "It's one of many services we provide in a total wellness package for our student athletes to put them in the best position to succeed."