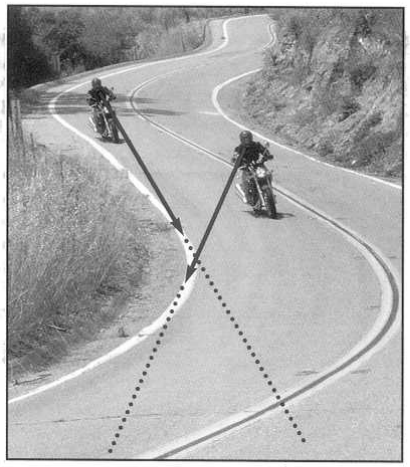
Cornering Supplement #1

SAFE cycling
Spring 2004

Where Should Riders Look?

The Basic *RiderCourse*℠ (BRC) and the Experienced *RiderCourse* Suite℠ (ERC Suite), along with other MSF Rider Education and Training Systems (RETS) training opportunities, stress the importance of riders keeping their head and eyes up when they are riding, and especially to look through turns when cornering. It is mentioned as an evaluation point in nearly all of the riding exercises.

But what does "keep head and eyes up" and "look through a turn" mean and how should riders be coached on the range? Let's look at what the research community has discovered about the use of eyes when operating a vehicle. Be aware that most scientific research on the visual process uses car driving as the basis of experimentation. The head-based video system used to determine scientifically where a driver looks would be far too cumbersome to be placed on the head of a helmeted rider.



Studies show that the gaze of a rider is directed to the tangent point of the curve about 80 percent of the time. As the rider's position in the curve changes, so does the tangent point.

First You See It

Some important research findings about vision and operating a motor vehicle were discussed in Johnson & Dark[1]. They confirmed that

- visual information is the primary source of information when driving;
- attention is important in perceiving things clearly and accurately.

Information available from peripheral vision, though still in the field of vision, is scarcely processed or not processed at all. Johnson and Dark point out that attention is a necessary part of developing a visual inspection strategy, especially in planning eye movements.

Eye Movement

Saccadic eye movements are the natural, rapid, irregular movements of the eye as it changes focus moving from one point to another. Crundall and Underwood[2] compared the differences in the focus of attention between novice and experienced drivers. The results of their investigations suggested that when experienced drivers are driving through curves or on demanding roadways, their eyes don't fixate on an object very often or for very long periods. The fixations being referred to are not target fixations where the eyes fixate for several moments. They refer to brief assessments of driving situations that correspond to saccadic eye movements.

Roving Eyes

Recarte and Nunes[3] found that in spite of the importance of being alert and constantly scanning for potential problems, very little research was done regarding eye movements while driving. Some studies used simulated experiences and showed that visual scanning requires a time-sharing strategy. After all, the eye cannot look at two locations at the same time.

They also mention that if eye movements reflect the amount of attention that is devoted to objects or locations, then a decrease of available attention should cause a reduction of the useful field of view, which could be relevant to safety. The lesson here is that when riding, the eyes should inspect the environment while at the same time evaluating significance, so the eyes must not fixate too long on any one spot. This is in alignment with *RiderCourse* coaching to keep the eyes moving to evaluate the many factors that could affect speed, lane position, or path of travel. More than ever we know that the eyes don't necessarily tell us what we see—we tell our eyes what to look for.

Off on a Tangent

While investigating how to engineer self-steering vehicles, Land and Lee[4] looked at the human visual process and found little direct information to link steering performance to where the driver was looking. Using recordings of steering-wheel angle and driver's gaze direction during a series of drives along a winding road, they found that drivers rely on the tangent point on the inside of each curve, seeking this point before each bend and returning to it throughout the bend. The gaze of the drivers was directed to the tangent point about 80 percent of the time, demonstrating the importance of this visual clue. It follows that a motorcycle operator would also find the tangent point of the curve to be quite meaningful.

Experience Does Matter

Summala and others[5] compared how novice and experi-

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enced drivers maintain their position in a lane ("lane keeping") using peripheral vision. Their experiments supported the hypothesis that novices need central vision (at first) for lane keeping, but with practice learn to stay in a lane using more peripheral vision. As skills become habits, considerably less thought is necessary for lane keeping.

This means that RiderCoaches should avoid having novices look too far ahead in turning and cornering while they are still learning basic control responses. RiderCoaches should adjust their coaching to accommodate the various skill and perception levels of riders.

Encourage Aggressive Use of the Eyes

Development of the MSF RETS rests heavily on principles of human learning and development. Curriculum development, field-testing, and the ultimate release of a formal course of instruction must be based on the principles of how people learn and develop perceptual and motor skills. Adherence to principles and their proper application forms the basis for decision making in terms of curriculum content and instructional methods. RiderCoaches should have a basic understanding of visual processes so they can more effectively coach riders to develop the habits of the eyes and mind that are necessary for reducing risk and enjoying the ride.

During both classroom and range sessions, RiderCoaches should encourage the aggressive use of the eyes to recognize a hazardous situation or a potential problem and be familiar with the three eye lead times (see the box at right).

Visual Lead Perspective

Following Distance The two-second following distance takes into account perception time (determining the need to stop) and reaction time (reacting with the brake controls). It is a minimum following distance that works at any speed when the braking distance of a vehicle and the vehicle it is following are generally the same.

Immediate Path The four-second immediate path generally corresponds to total stopping distance and provides the distance needed for an escape should a traffic or roadway problem suddenly develop. If skilled riders have four seconds of space to the front or sides in which to stop or maneuver, they are likely to have the time (and space safety margin) to avoid a crash.

Anticipated Path The twelve-second anticipated path provides enough time for a rider to assess potential factors that could interact to increase risk.

Go Where You Look?

Does a motorcycle go where its rider looks? Of course not. If this were true, a rider could simply avoid a crash by looking elsewhere. If this were literally true, a rider would swerve every time a blind spot was checked or a rider looked at beautiful scenery off to the side. To cause a motorcycle to move from a straight path of travel, there must normally be some physical input—the handlebars must be moved.

The science of motor skills development suggests that learners develop gross psychomotor skills first (the learner consciously tells the nerves and muscles what to do and they react) followed by the development of finer perceptual motor skills (the brain tells the muscles what to do without any conscious thought on the rider's part). As a rider's gross inputs lead to improved accuracy, the brain can then consider higher-order processes such as evaluating the interaction of factors further ahead.

Target Fixation

What's the difference between target fixation and looking where you want to go? Target fixation is when you look at a fixed point for more than a couple of seconds. This may narrow the useful field of view and in extreme cases can become inattentional blindness.

When riders turn or corner on the range, those who fixate on a given point in the distance might miss certain factors that are important for safety, such as surface conditions or proper path of travel. Riders on the street might miss objects in their immediate path of travel. A rider should look where he is going but avoid target fixation by moving his eyes throughout an intended path of travel. Riders should also realize that mental attention increases their useful field of view.

Turning and Cornering

Where should a rider look when turning and cornering? From the visual lead perspective, at least four seconds ahead in the intended path. This is the minimum amount of time necessary to straighten and brake in the best of conditions, but of course more time and space is better.

Ideally riders would be able to look, with short and frequent glances, 12 seconds ahead through a corner to evaluate the roadway and traffic factors that could affect speed, lane position, or path of travel. Although this may be possible on a motorcycle range, common roadway environments may not allow a full 12-second search because of factors such as natural terrain, surface obstacles, darkness, and traffic.

As riders practice their skills on the range, they should be encouraged not to stare at any one cone or any one point in their path of travel (target fixation). A rider must develop the ability to gather important information and transfer it into proper and skillfully-timed motor skills. RiderCoaches should encourage motorcyclists to keep their head and eyes up and look through turns. Although riders should pay attention to where they are going, they should not be led to believe that a motorcycle simply goes where they look.

Evaluate Your Own Riding

Riding a motorcycle safely is more a skill of the eyes and mind than of the hands and feet. The mental aspect of effectively and efficiently negotiating the traffic jungle and the variety of riding environments is the cornerstone of safe and responsible riding.

RiderCoaches may be able to gain valuable insight into their personal riding habits and techniques by reflecting on what they actually do when cornering. When negotiating corners on your next ride, notice where your attention is. How far do you look through a turn? Do you spend your time looking at the end of the curve or at the tangent point? Is it the same for all curves or do you adjust for variations? How do you divide your attention between surface conditions and path of travel? How often do you catch yourself fixating? Can you tell the difference in your awareness when

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you tell your eyes what to look for instead of relying on your eyes to pick up important factors?

Check what you do when performing *RiderCourse* exercise demonstrations to see if your eye movements match up. One of the best exercises in which to check these techniques is ERC Suite Exercise 9, Multiple Curves, where it is necessary to combine the good visual process of keeping the head up and eyes moving while maintaining a proper path of travel and lane position.

Make Your Coaching More Meaningful

Coaching is powerful when riders are provided timely tips that boost them to accomplish a mental or physical skill they otherwise would not learn on their own. It's what gives riders an advantage in developing motor skills or learning the critical strategies for riding on the road. This is why it is important that RiderCoaches understand the principles of the BRC and know the *whys* and not just the *hows* of safe riding techniques.

For additional information regarding the importance of visual perception and its connection to motor skill development and identifying important clues in traffic, visit the MSF Rider Education and Training System Online Resource Guide (RETSORG). MSF continues to expand this valuable resource in an effort to provide RiderCoach resources to promote a better understanding of the mental and physical skills of safe and responsible motorcycle operation. **SC**

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