

William L. Park, OD, FAO
Herb Simon, BS, MEQ, CDRI

Driving and Visual Impairment: What if it was your life?

Driving a motor vehicle is one of the most dangerous activities that the majority of people do each day. If one takes into account all the wars in which this country has participated, more Americans have been injured and killed in auto crashes than all those who have been injured or died on battle fields defending our freedom.

With visually impaired individuals, there is, and always will be, controversy about driving ability. The ability to drive is the ultimate form of independence in today's society. In the United States, a driver's license is intrinsically tied to quality of life. Of essence, elderly drivers are the most rapidly growing segment of the driving population in the United States.¹⁻⁹

There are many important issues to consider regarding visually-impaired drivers. We must consider the impact that the ability of visually impaired individuals to drive can have on society. We have to determine if there should be different standards for re-licensure of the older adults or for people with progressive ocular or systemic disease (such as diabetes) and if the vision screening process performed by the motor vehicle administration incorporates tests that measure the appropriate dimensions of vision performance.¹⁻⁵

First and foremost, it is important to ensure that visually-

impaired individuals have obtained maximal correction for their eyes and that best corrected visual acuity (BCVA) has been achieved. The following areas should be tested during clinical evaluations to determine if the patient has the visual capability to drive safely: BCVA, recognition of low contrast objects (background and environment), glare sensitivity (i.e., headlights, traffic lights, brake lights), color perception, binocularity (use of both eyes), depth perception and visual fields.^{2-7,9}



Environmental Low Contrast



Visual Confusion and Glare

Other areas of concern may include: assessment of visual function when performing activities of daily living as evaluated by certified ophthalmic personnel, a certified low vision therapist, orientation

and mobility specialist, and/or by an occupational therapist; determination of whether the patient has psychosocial characteristics detrimental to driving; and determination of implications of any ocular/systemic diseases that are present that might be prohibitive to safe driving. Further evaluation to be addressed as indicated should include: visual perceptual testing, Mini Mental State Examination, assessment of extremity strength, range of motion and reaction time.²⁻¹¹

These authors and colleagues found that there is an inappropriate focus on visual acuity. The focus should be more on visual processing, consideration of psychosocial implications and past/current driving skills that can lead to morbidity. For example, poor driver education of today's older adult drivers may be partly due to the fact that they received driver's education, if any, in the early 1940s, or in states where driver's education may have been lacking. We also find that visually impaired drivers often lack an active, ongoing, subjective thought process to compensate for their visual impairment.²⁻¹¹

Areas of Concern

Are you good driver?

Driving a car can be likened to any sporting event where the player who commits the fewest errors is



the winner. All of us commit many driving errors every time we get behind the wheel. We should be aware that there is a relationship between the number of errors that we commit while driving a motor vehicle and collisions. Errors that we make when we get behind the wheel include: spending too much time looking into the mirror, not adjusting our speed or position properly, failing to check our mirrors when facing a potential risk, not providing space to escape a potential risk, concentrating on something other than our driving, selecting the wrong information to process, improper braking techniques and tailgating.

Studies both in America and Europe clearly show that if a driver were given one-half of a second more time to respond to a challenge, fifty percent of all collisions could be avoided.

Increasing our Response Time

Increasing our response time means that we will have more

time to process information and/or have more time or space to stop, steer or accelerate when faced with a challenge. Increasing our response time even a fraction of a second can make the difference between life and death.

First, increasing our response time would mean that we will have more time to search for information or that we will have increased the amount of time that we can see ahead. This gives us more time to process information that will allow us to pick up information sooner and prevent possible collisions. Being able to process information well, when operating a motor vehicle, is key to safe driving. The sooner we process information, the more time we will have to prepare and respond to a potential risk.

Speed Reduction is an Important Technique of Increasing Response Time

First, reducing speed will give us more time to search for information and will increase the amount

of time that we can see ahead.

Increasing Braking Time

Second, reducing our speed will significantly reduce the amount of space needed when stopping or steering to avoid a collision. When given any amount of space, needing less space to control our vehicle will give us more time to execute the proper response.

Increasing Steering Time

As we have just noted, reducing the speed of a vehicle significantly increases response time by giving us more time to process information and more time to execute a braking response. If ever faced with an emergency, reducing our speed beforehand could allow us to execute an evasive maneuver with much better control.

In summary we should now know that decreasing speed will do the following:

- Increase response, processing, braking and steering time
- Allow us to steer less and more gradual when using an evasive technique
- Reduce the severity of a collision considerably
- Prevent us from taking risks that involve a minimal gain with great loss
- Lose minimal amount of time

Increasing Response Time by Adjusting Our Lane Position

A very important technique to increase response time is to adjust our lane position by increasing the distance between a potential risk and ourselves. Increasing the distance will not only give us more

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time to respond but will reduce the amount of steering needed considerably, when evasive steering is needed.

Adjusting our speed and our position are two very important techniques for increasing our response time and for helping us to avoid collisions, and should be taught in all driver education courses.

Increasing Response Time by Developing Proper Search Habits

We must know how and where to search for information, what information to search for and when to search specific areas. Areas of search should include immediate front, periphery, and rear mirrors as well as inside the vehicle.

1. When searching for information directly in front of our vehicle, we should be able to process information at least 30 to 40 seconds ahead.
2. We cannot possibly properly prepare for the risk ahead if

we are not aware of challenges that are approaching the rear and sides of our vehicle.

3. Mirrors should be checked every time we are about to make or anticipate making any change in speed or position.
4. Most emergencies begin when a risk from the periphery enters our immediate path or forces another vehicle to enter our path, or when a vehicle ahead stops abruptly.
5. We should concentrate on the information directly ahead of our vehicle. Anytime we need to process information in any other area, we should use only a quick glance to process that information, then immediately return our vision to directly ahead.
6. There are many factors that could affect our ability to process information or respond to that information. They can come to us from the environment, our vehicle and from our own self. Darkness, fog, a blinding sun or heavy rains are just a few of the many environmental factors that will make processing information more difficult. Many of these environmental factors can be minimized by the use of absorptive filter lenses. These lenses enhance contrast sensitivity, reduce or eliminate glare, and accentuate the visible red-green color spectrum helping us better identify traffic lights, brake lights and pedestrians in a poor contrast environment.

7. Factors within our own vehicle (such as poor functioning windshield wipers, heater, defroster and headlights) can limit our ability to process information. Anytime we have to deal with factors affecting our ability to process, we must reduce our speed.
8. The three characteristics that make one risk more dangerous than another are the probability that it will challenge us, the quickness in which it can challenge us and the consequences we will experience (damage, loss or injury).
9. Whenever we see brake lights ahead, we should assume the driver ahead sees something we do not see or that they are about to make a threatening maneuver.
10. The difference between perception and reality causes many collisions.

All of us must be aware that we can choose to be either a safe driver or an unsafe driver. When we concentrate on our driving, and anticipate and prepare for risk by adjusting our speed and position, we will be much safer. There are many among us who are very capable of driving safely who tailgate, do not concentrate, or who drive too fast. On the other hand, there are many who may have an impairment of some kind who, with effort, knowledge and understanding, can learn compensatory skills that enable them to become a safe driver.

William L. Park, OD, FAAO, is in private practice in Wichita, KS. Dr. Park is committed to outreach efforts in stemming the epidemic of diabetes. He works exclusively with patients referred for low vision evaluation, low vision rehabilitation and neurological vision loss. He is a past Director of Low Vision Services, Lions Research & Rehabilitation Center, Wilmer Eye Institute-Johns Hopkins University. Dr. Park can be reached at William L. Park, OD, LLC, www.parklowvision.com, 610 N. Main, Suite 201 Wichita, KS. 67203, (316) 440-1690 or drpark@parklowvision.com.

Herb Simon, BS, MEQ, CDRI Herb Simon has over 40 years of experience as a driver education instructor. He holds a Bachelor of Science degree in Physical Education (with a minor in Driver Education) and a Master's Equivalency in Safety Education from the University of Maryland. Simon has served on committees to develop driver education curricula for Baltimore City Public Schools and the Maryland Motor Vehicle Administration.

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Continuance of Driving: A Rare Rapid Positive Outcome Following a CVA

William L. Park, OD, FAAO

An 80-year-old female was referred for a rehabilitative consultation following a CVA of the right occipital lobe (CT scan) suffered on November 20, 2008.

Etiology for the CVA was malignant hypertension of 220/100 upon arrival at the ER of a local hospital and the patient was transferred upon stabilization to a larger hospital for continued care. Ophthalmological hospital consultation revealed mildly reduced visual acuity in the left eye and was noted to be normal in the right eye.

Visual field evaluation revealed a “dense left-sided hemianopsia in the right and left eyes (loss of left side of visual field in each eye).”

Posterior segment evaluation revealed a relatively clear lens in the right and left eyes. There was no significant presentation of macular degeneration in either eye.

The patient was seen 15 days following the CVA as a result of a telephone conversation with the referring ophthalmologist. She had initially been advised that she should not drive based on her visual field and recovery was guarded. Health history was significant for 80 percent blockage of the right carotid artery (with an endarterectomy scheduled for two to three months), right and left knee replacement and arthritis.

The patient denied any visual difficulty with reading, other ADL



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tasks, meeting patient-stated goals or the presence of diplopia or field loss. The Geriatric Depression Scale (GDS) revealed a score of 0 and the Mini-Mental Status Examination (MMSE) revealed a score of 27 (highest positive score for both tests). Social history revealed she lived alone (widow of two years) in a rural area, with a son and daughter living within 10 miles of her home who were very supportive and visited her frequently.

Best-corrected visual acuity was OD 20/20+2, OS 20/25, OU 20/20 with excellent reading capability 40/. 3M (20/20), with minimal change of the habitual prescription. The patient was fluent with reading (continuous text).

Pelli Robson contrast sensitivity was OD log contrast 1.80, OS 1.65 and OU 1.95, indicating excellent low contrast identification of

print, objects and environment. Extraocular motility was full and smooth, with excellent pursuits, saccades and rotations (eye movements). Worth 4 Dot revealed binocularity (use of both eyes) with no suppression. Stereopsis was 40 seconds of arc. Vergences revealed minimal I PD esophoria and I PD right hyperphoria vertically at distance and near. Observation, evaluation (exam room) and a 100-foot walk with three turns (L-R-L) revealed no presence of neglect, abnormal body posture or presence of anterior-posterior or right-left Visual Midline Shift Syndrome.

Anterior segment evaluation revealed normal pupillary responses, with no presence of afferent pupillary defect. The cornea, anterior chamber and lens were clear bilaterally. IOP and dilated fundus

examination was deferred to her primary care optometric practitioner and retina specialist.

Goldmann visual fields were performed which indicated OD 60° nasally, 90° temporally, 60° inferiorly, 40° superiorly and OS 60° nasally, 90° temporally, 65° inferiorly and 40° superiorly (V4e, III2e).

Social history revealed her husband had died almost two years prior and that the patient lived in a rural area of Kansas and therefore needed to drive to maintain independence.

Primary activities of daily living goals were traveling to church, hair salon, visiting her daughter, health-care appointments, grocery store and pharmacy, restaurants for lunch and dinner, and socialization at the community senior center.

The patient was taken on a road evaluation (initiated by and with the author (WP) present) on December 7, 2008, from her home located approximately five miles from a rural town (pop 3,500) in Kansas.

The total drive time was approximately 50 minutes. The

course was primarily of dirt road and asphalt/cement. The conditions were good with clear to slightly cloudy sky. Attention was paid to a prior history of left homonymous hemianopsia secondary to a stroke suffered the prior month.

Throughout the evaluation, the patient demonstrated excellent processing skills, defensive driving, space and lane placement, right and left-hand turns, awareness of signal traffic lights recognition, and appropriate following distances.

Intentionally requested left turns were 16; approximate right-hand turns were 12. At no time during the initial phase of the road evaluation did she demonstrate any left-neglect. She identified such buildings and objects as multiple churches, business establishments, recognition of a flag at half-mast from approximately a quarter-mile away, a tractor, a car approaching her intersection from the left and timely recognition of all locations for which she needed to travel for community integration.

There were continuous ongoing questions regarding recognition

of objects or events taking place to the left, right and central visual field as we are driving throughout the route.

There was recognition of the fact that she needed to slow down to a speed limit of 30 miles per hour (from 60mph speed limit) approximately 600 yards from the sign indicating she do so, which spoke for her visual acuity, as well as her cognitive process.

Throughout the entire evaluation, she drove defensively with excellent awareness of her surroundings, events and other stimuli. She was well aware of north, south, east and west directions.

There was an event coming back to her house (which was a circular route) where a large pickup truck came over the hill into her lane, travelling over the speed limit. She reacted immediately to this oncoming truck, veering to the right for avoidance, as that driver corrected his own reckless driving endeavor.

In summary, the patient demonstrated safe driving skills with excellent cognitive processing, visual awareness, searching techniques and response times to all surroundings and stimuli and appropriate driving actions throughout the 50-minute road evaluation. Recommendations were made that she see her optometrist as directed on her last consultation and her retina specialist for ophthalmological closure. I also recommended that a Goldmann visual field be performed in March of 2009.

This case indicates the social importance of driving to maintain quality of life despite age, as well as timely assessment to ensure that the issue was not compromised resulting in isolation and potential depression.

