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2019 Jenny Pomeroy Award for Excellence in Vision and Public Health

Megan E. Collins, MD, MPH

Johns Hopkins University

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National Summit

A Lifetime of Vision
July 17, 2019 | National Press Club | Washington D.C.

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Recipient:

2019 Jenny Pomeroy Award for Excellence in Vision and Public Health

Cynthia Owsley, PhD, MSPH

University of Alabama at Birmingham

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Thinking outside the box

- A necessary strategy for advancing public eye health

Vision and Driver Safety

- Conventional wisdom was that good visual acuity is critical for safe driving.
- Visual acuity is the ubiquitous screening test when applying for a license
- Why?
  - Visual acuity is the clinical tool for assessing vision in the comprehensive eye examination
  - Design guidelines for road signs based on sight distances assuming the drive has at least 20/30-20/40 acuity.

The Problem

- Visual acuity is not related to motor vehicle collision risk.
- Drivers with 20/100 visual acuity do not have higher collision rates than drivers with 202/20 visual acuity.

- **Are their types of vision impairment that do elevate collision risk?**

Visual Demands of Driving Are Intricate

- Controlling a vehicle takes place in a visual cluttered environment
- Involves the simultaneous use of central and peripheral vision
- Driver uncertain when and where an important visual event will occur
- Information must be taken in at a rapid rate as the vehicle moves through the roadway environment
- Collisions are with large objects, not with objects at the limits of spatial resolution.

Visual processing speed

- The amount of time needed to make a correct judgment about a visual object or event.
- Probed under conditions where have to attend to both central and peripheral vision
- And under conditions where there are other visual distracting objects and events
- Sounds like a skill set that could be important when driving?

JAMA

Visual Processing Impairment and Risk of Motor Vehicle Crash Among Older Adults

Cynthia Owsley, PhD; Karlene Ball, PhD; Gerald McGwin, Jr, MS; Michael E. Sloane, PhD; Daniel L. Roenker, PhD; Milton F. White, MD; E. Todd Overley, OD, MS

JAMA, April 8, 1998—Vol 279, No. 14

About 30% of older drivers have slowed visual processing speed

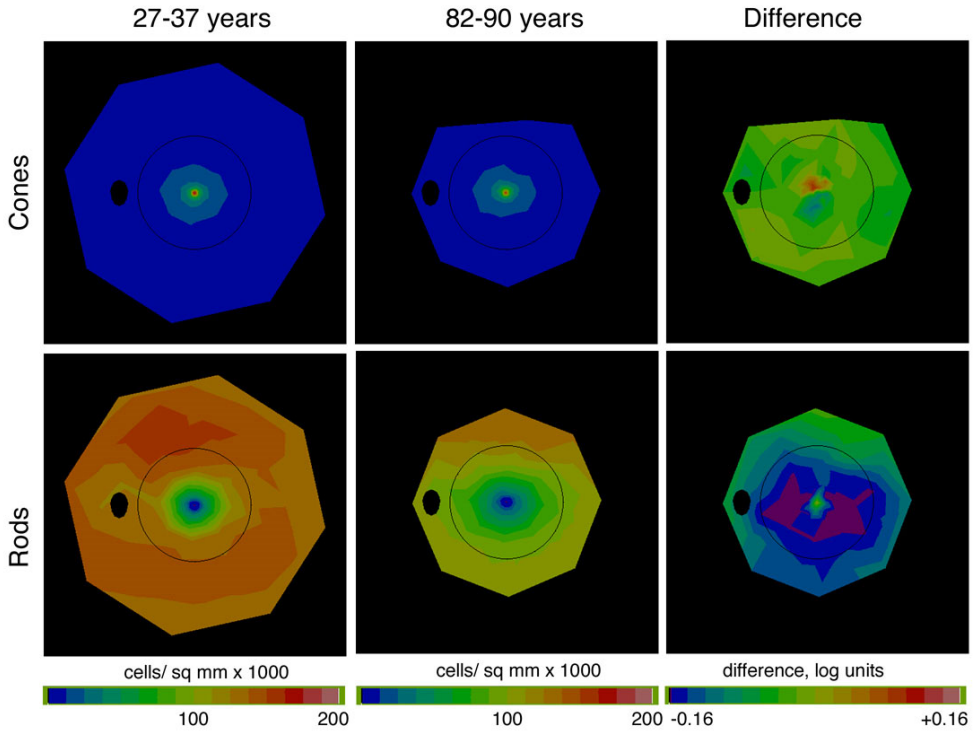
- **Slowed visual processing speed doubles collision risk**
- Has been replicated many times by us and other research groups
- Visual processing speed tests are now used in rehabilitation clinics to understand crash risk of older and medically compromised drivers
- Have been considered by at least two states as a screening test for drivers
- Stimulated research to look at other types of visual dysfunction as risk factors -- visual acuity is no longer considered the most important visual factor contributing to driver safety

Age-Related Macular Degeneration (AMD)

- The conventional wisdom until recently is that AMD is fundamentally a cone photoreceptor disease.

The Problem

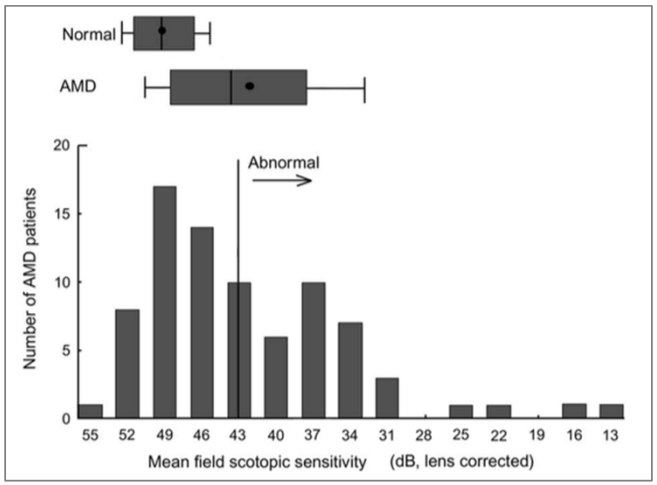
- Rod loss, not cone loss, is characteristic of both aging and early AMD

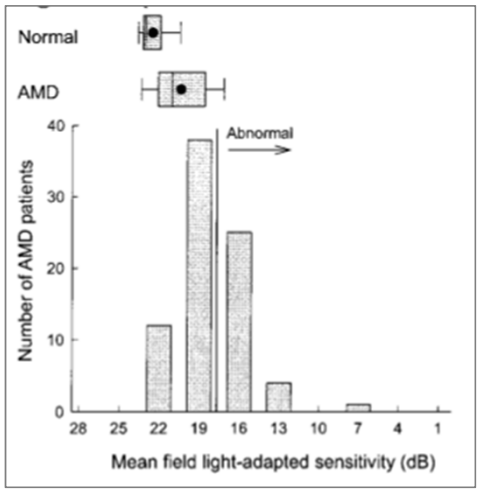


During aging rods decrease by 30%, near the fovea; cones are protected. In AMD rod loss typically exceeds cone loss; in end-stage AMD, surviving photoreceptors are largely cones.

Slide courtesy of C. Curcio:
Curcio et al. *IOVS* 1993; 34: 3278; re-plotted in Jackson et al. 2005. In *Macular Degeneration*. Penfold, Provis (Eds.), Springer-Verlag, pp. 45-62.

The sensitivity of rods are impaired in aging and early AMD, but not of cones

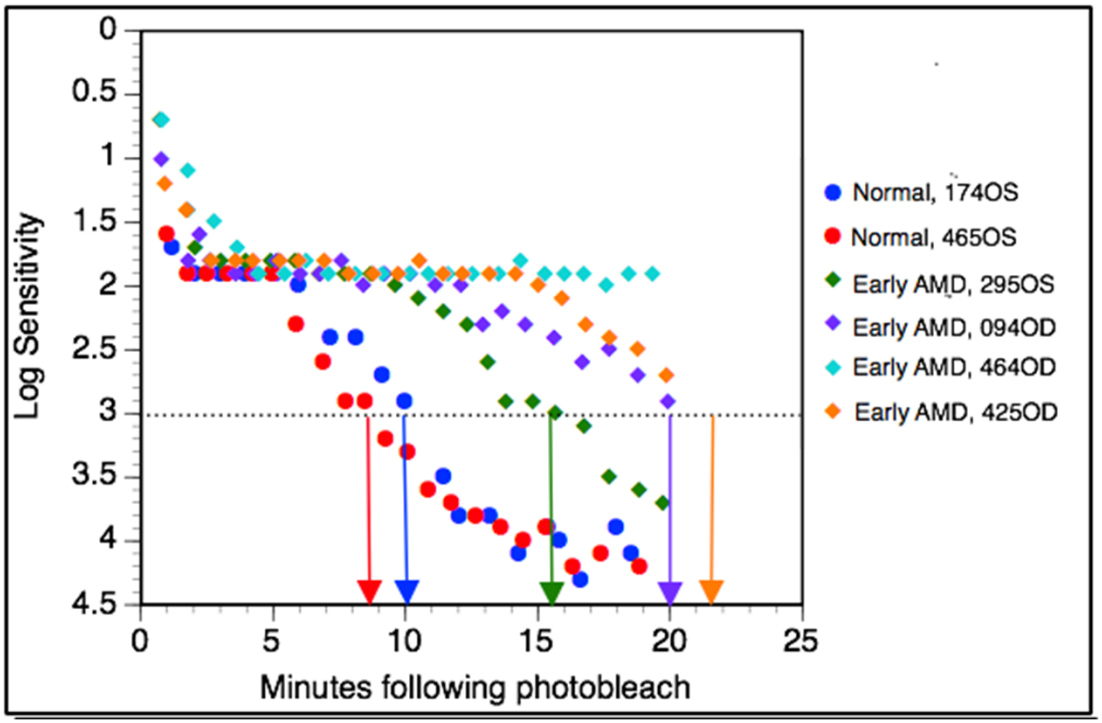




Photopic sensitivity deficits can occur however they are less prevalent and smaller.

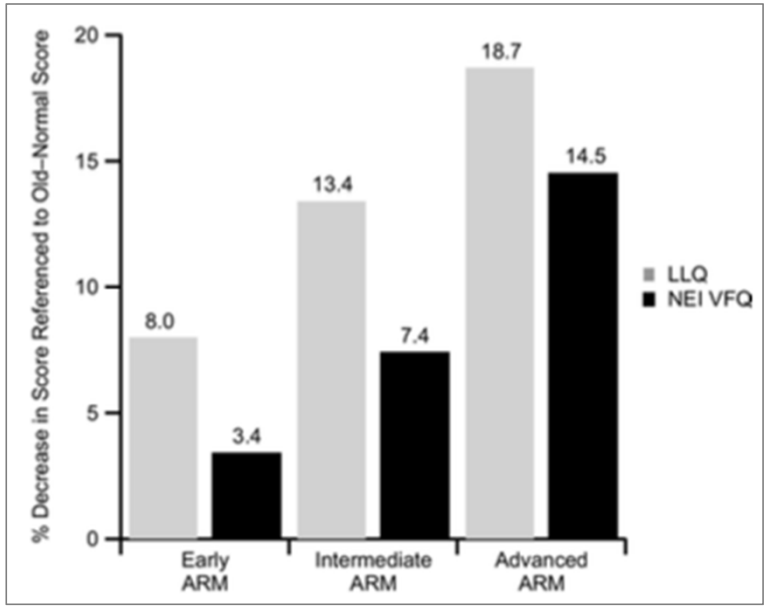
Owsley, Jackson, Cideciyan, ...Jacobson *IOVS* 2000; 41:267-273

Rod mediated dark adaptation is slowed in aging and AMD



Owsley, McGwin, Clark, Jackson, Callahan, Kline, Witherspoon, Curcio. *Ophthalmology* 2016; 123: 344-351.

And patients symptoms were much worse in dim environments as compared to brighter ones.



Scilley, Jackson, Cidiciyan . . . Jacobson, Owsley. *Ophthalmology* 2002

Owsley, McGwin, Scilley, Kallies *IOVS* 2006.

Owsley, McGwin. *BMC Ophthalmology* 2016.

Owsley, McGwin, Jackson et al. IOVS 2006.

Re-thinking the approach to preventing AMD

NEW DEVELOPMENTS

Spare the Rods, Save the Cones in Aging and Age-related Maculopathy

Christine A. Curcio, Cynthia Owsley, and Gregory R. Jackson

We argued for a focus on the earliest signs of AMD and the mechanisms underlying the demise of rod photoreceptors.

Our work has stimulated research on the earliest functional biomarkers of AMD, and interest in the development of endpoints/outcomes involving rod vision.

And the development of an apparatus to measure dark adaptation

Curcio, Owsley, Jackson *IOVS* 2000; 41: 2015-2018.

Delayed Rod-Mediated Dark Adaptation Is a Functional Biomarker for Incident Early Age-Related Macular Degeneration

Cynthia Owsley, PhD,[1] Gerald McGwin, Jr., PhD,[1,2] Mark E. Clark, BS,[1] Gregory R. Jackson, PhD,[3] Michael A. Callahan, MD,[1] Lanning B. Kline, MD,[1] C. Douglas Witherspoon, MD,[1] Christine A. Curcio, PhD[1]

Purpose: To examine whether slowed rod-mediated dark adaptation (DA) in adults with normal macular health at baseline is associated with the incidence of age-related macular degeneration (AMD) 3 years later.

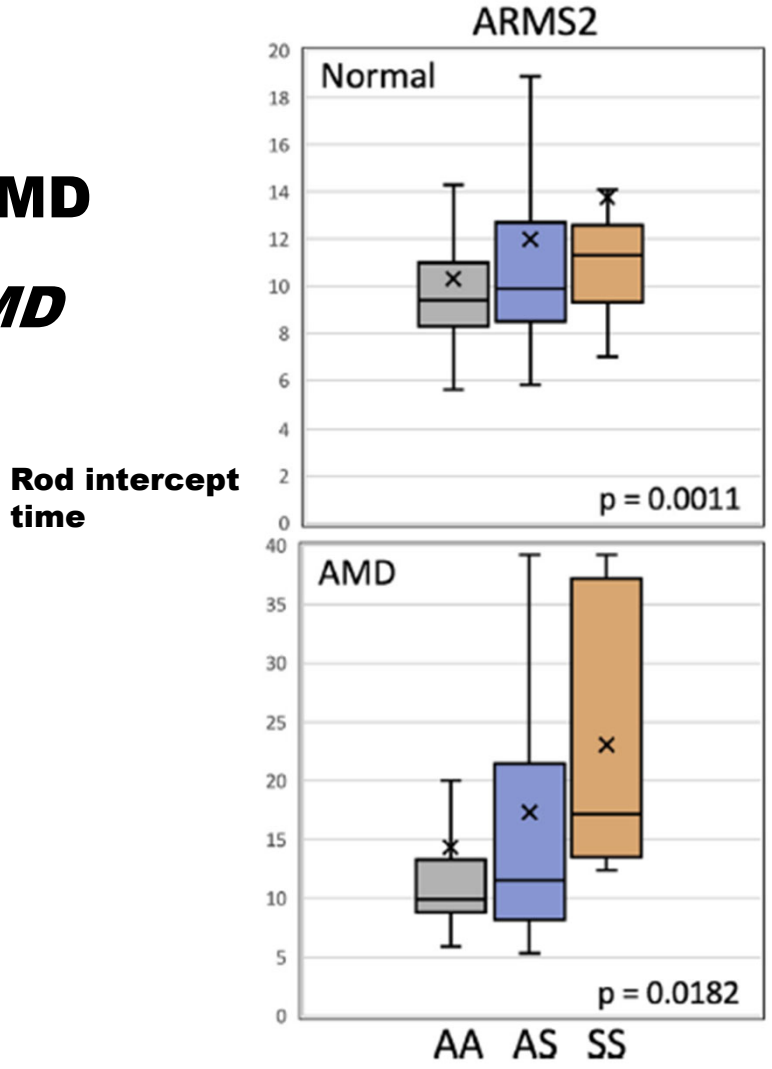
ALSTAR
Alabama Study on Early Age-Related Maculopathy

Older eyes in normal macular health at baseline	Dark adaptation at baseline		Age and Smoking adjusted RR (95% CI)	P-value
	Normal N=263 n (%)	Abnormal N=62 n (%)		
Incident AMD in tested eye 3 years later	26 (9.9)	13 (21.0)	1.92 (1.03 - 3.62)	0.04
Incident AMD in either eye 3 years later	39 (14.8)	17 (27.4)	1.70 (1.01 - 2.86)	0.04

Eyes with abnormal dark adaptation were 2 times more likely to develop incident AMD within 3 years.

Owsley, McGwin, Clark, Jackson, Callahan, Kline, Witherspoon, Curcio. *Ophthalmology* 2016.

ARMS2, one of the strongest AMD genes, is associated with dark adaptation delay *before the AMD clinical phenotype emerges.*



As a result of our work,

- AMD research groups around the world are now focusing on rod vision and the biological mechanisms that support it as an important key to understanding how and why AMD develops.
- It is our belief that treatments will be forthcoming once the mechanistic causes of rod photoreceptor loss are understood.

Acknowledgments

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Department of Ophthalmology and Visual Sciences

Thank you.

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