

PSY 4036

Week 5: Aging Vision and Central-Vision Loss

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Topics: Add WeChat powcoder

Age-related changes in normal vision.

Age-related macular degeneration (AMD)

Impact of central-vision loss.

What it's like to lose your central vision.

People in the United States Over 65 Years Old

Year	Percentage of Population	Number of People (millions)
1900	5%	4
2018	16%	52
2030 (projected)	20%	73

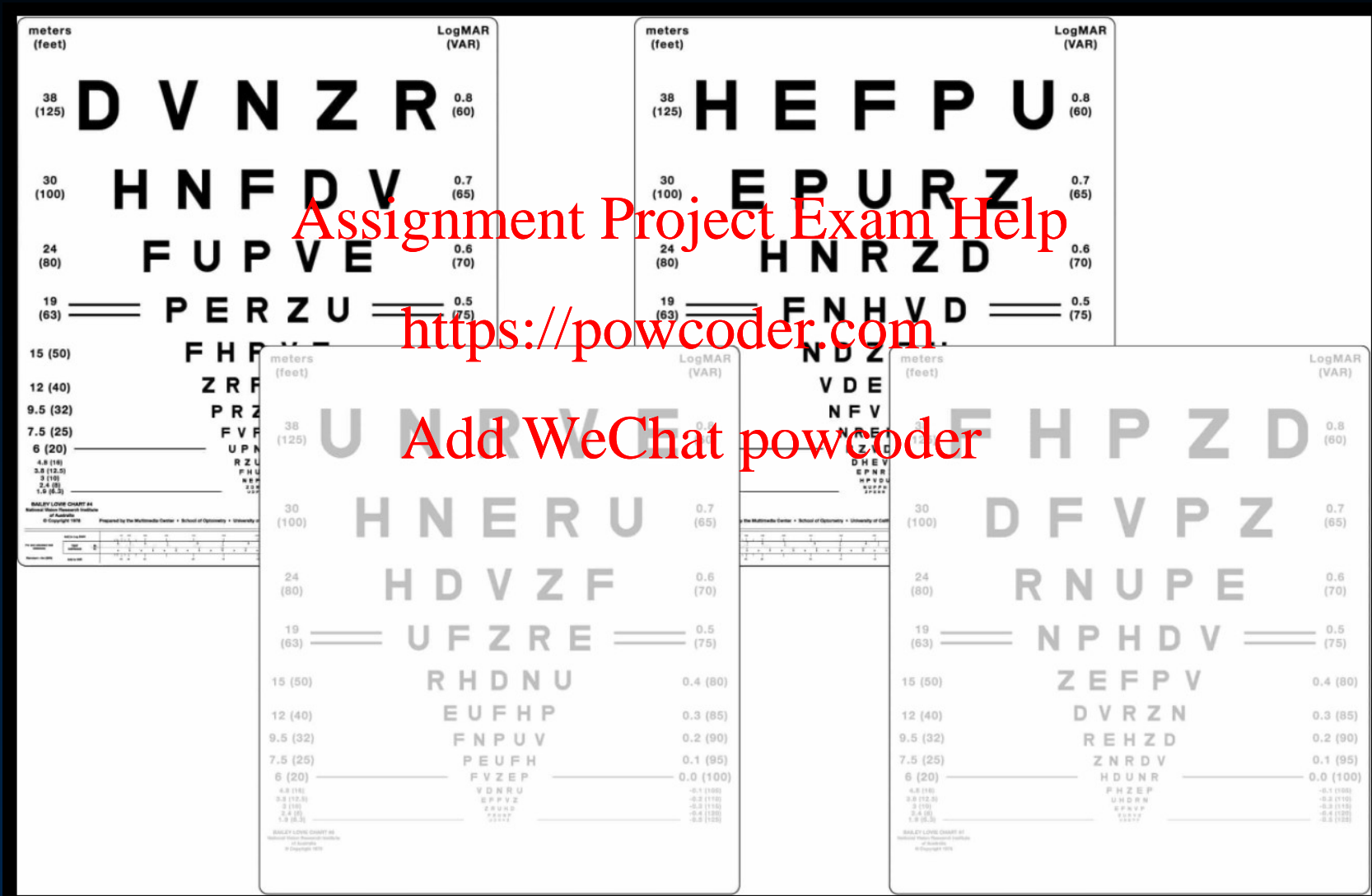
Age-Related Changes in Normal Vision

Presbyopia	Reduced range of accommodation, results in reduced ability to focus and the need for bifocals.
Reduced Range of Pupil Size	Harder to see in dim illumination with small pupils.
Sub-Clinical Cataract	Increasing glare effects, especially at night.
Slower Light & Dark Adaptation	Takes more time to adjust to changes in illumination.
Acuity, Contrast Sensitivity & Field	To be discussed in class.
Reduced Stereoacuity	Impact on 3D depth perception

**Haegerstrom-Portnoy, Schneck & Brabyn (1999):
“Seeing into Old age: Vision Function Beyond Acuity.”**

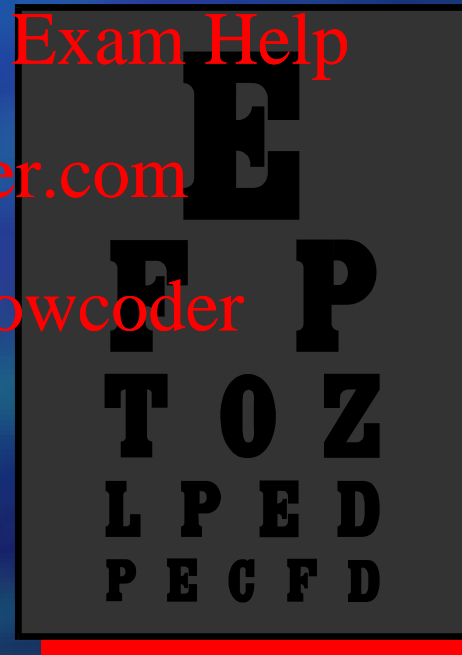
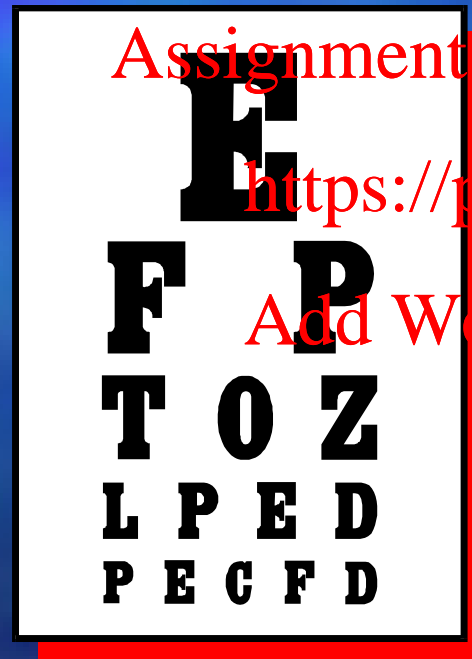
- Purpose: To provide a comprehensive description of vision function beyond acuity in older individuals.
- Longitudinal study in Marin County, California
- Sample of 900 individuals between the ages of 58 and 102 years (mean 75.5)
- Battery of vision tests including acuity chart, Pelli-Robson chart, and SKILL card.

Bailey-Lovie Low Contrast Acuity Chart



SKILL CARD

(Smith-Kettlewell Institute
Low Luminance/Low Contrast)



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Average Acuity Values Comparing Ages 55 and 95 Years

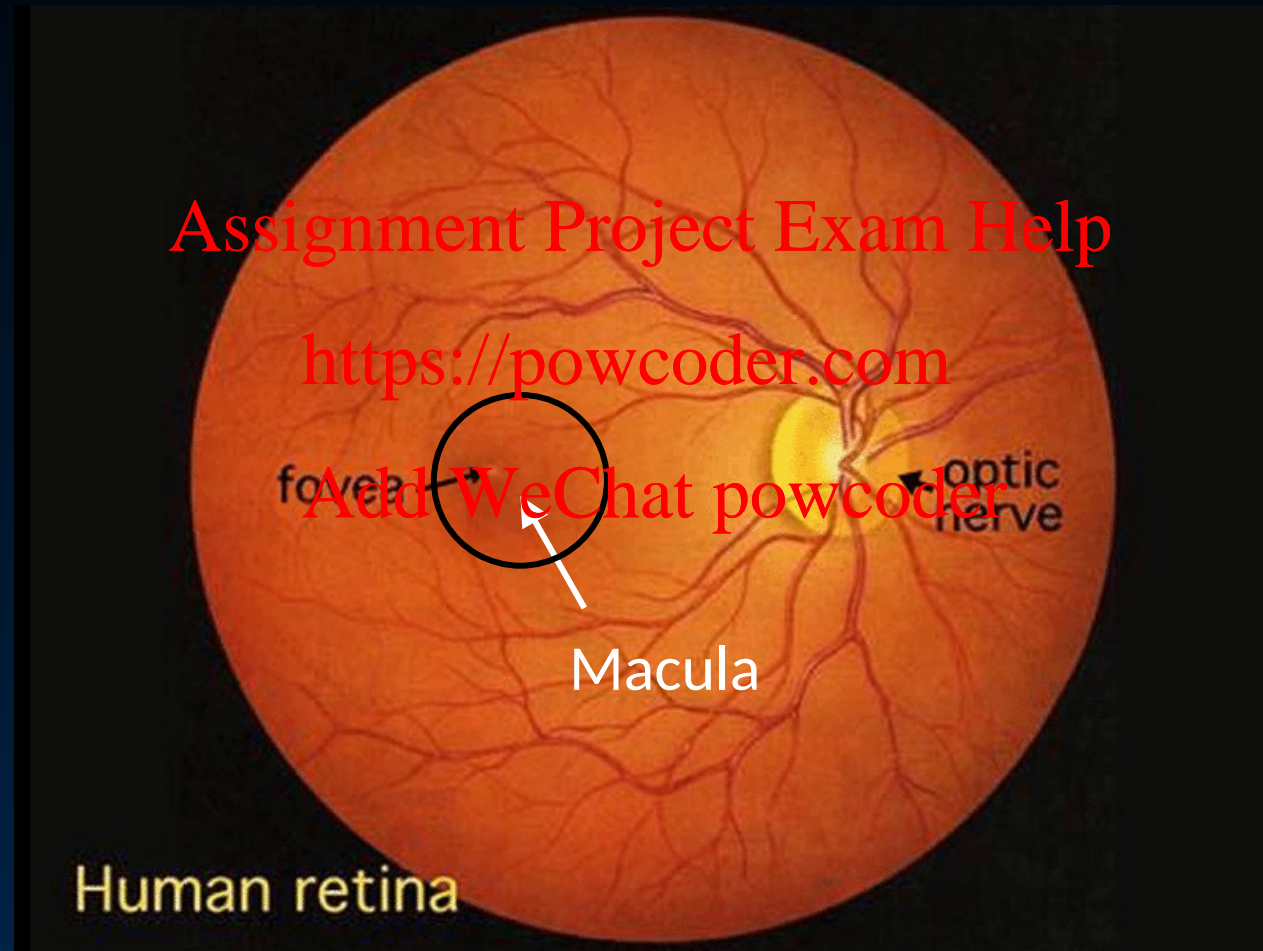
Test Type	Luminance	Contrast	Age 55	Age 95
Eye Clinic	High	High	20/20	20/40
Low Contrast Acuity Chart	High	Low	20/30	20/130
SKILL	Low	Low	20/60	20/200

Summary Results from the Marin County Study

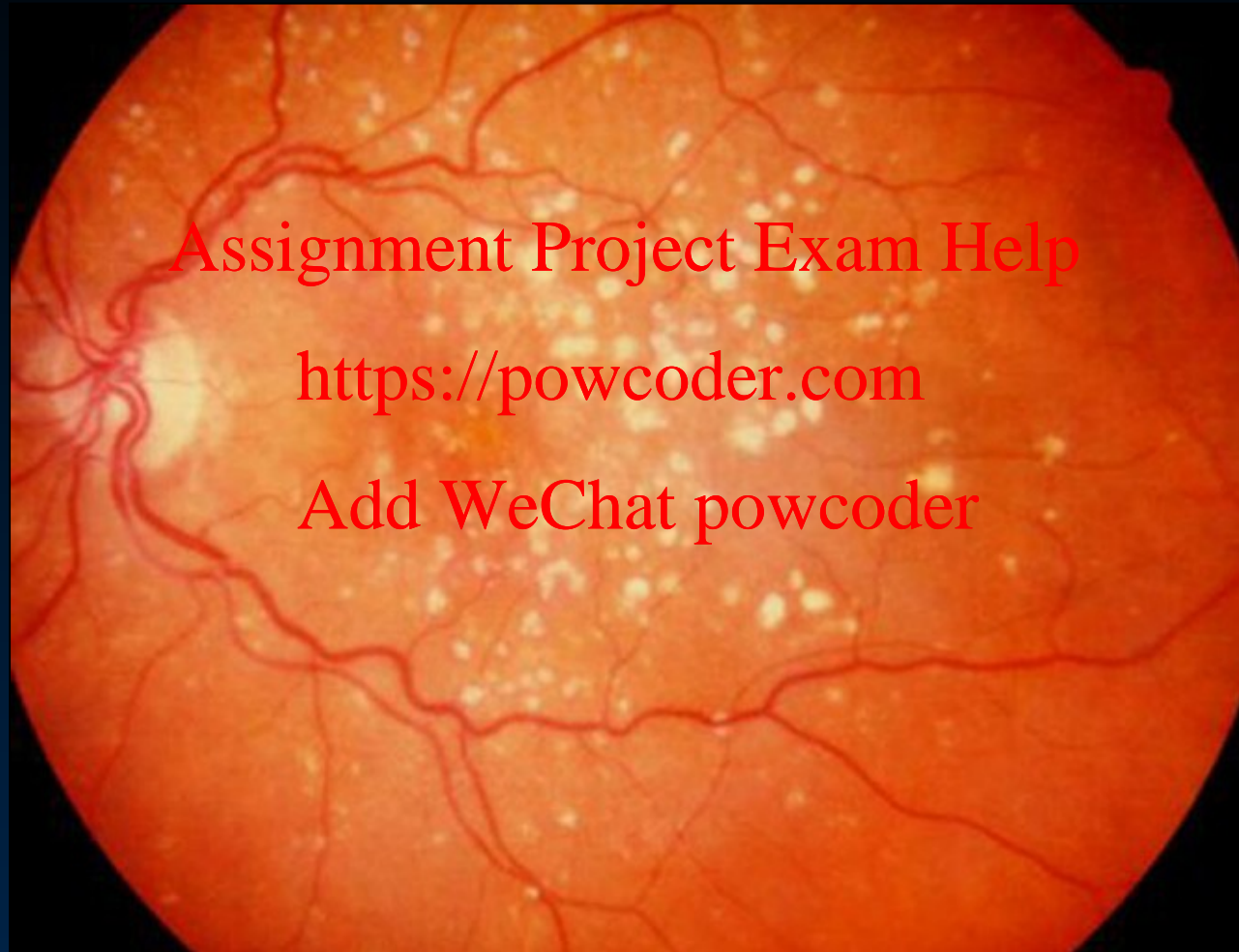
Conclusions

- Healthy eyes show visual impairment in old age. Standard acuity and field measurements underestimate these impairments.
- Deficits show up in low luminance, at low contrast, in glare, when there are concurrent attentional demands, and in stereo depth.
- Impaired vision increases risk of falls and also fear of falling.
- Coexisting health conditions compound these difficulties.

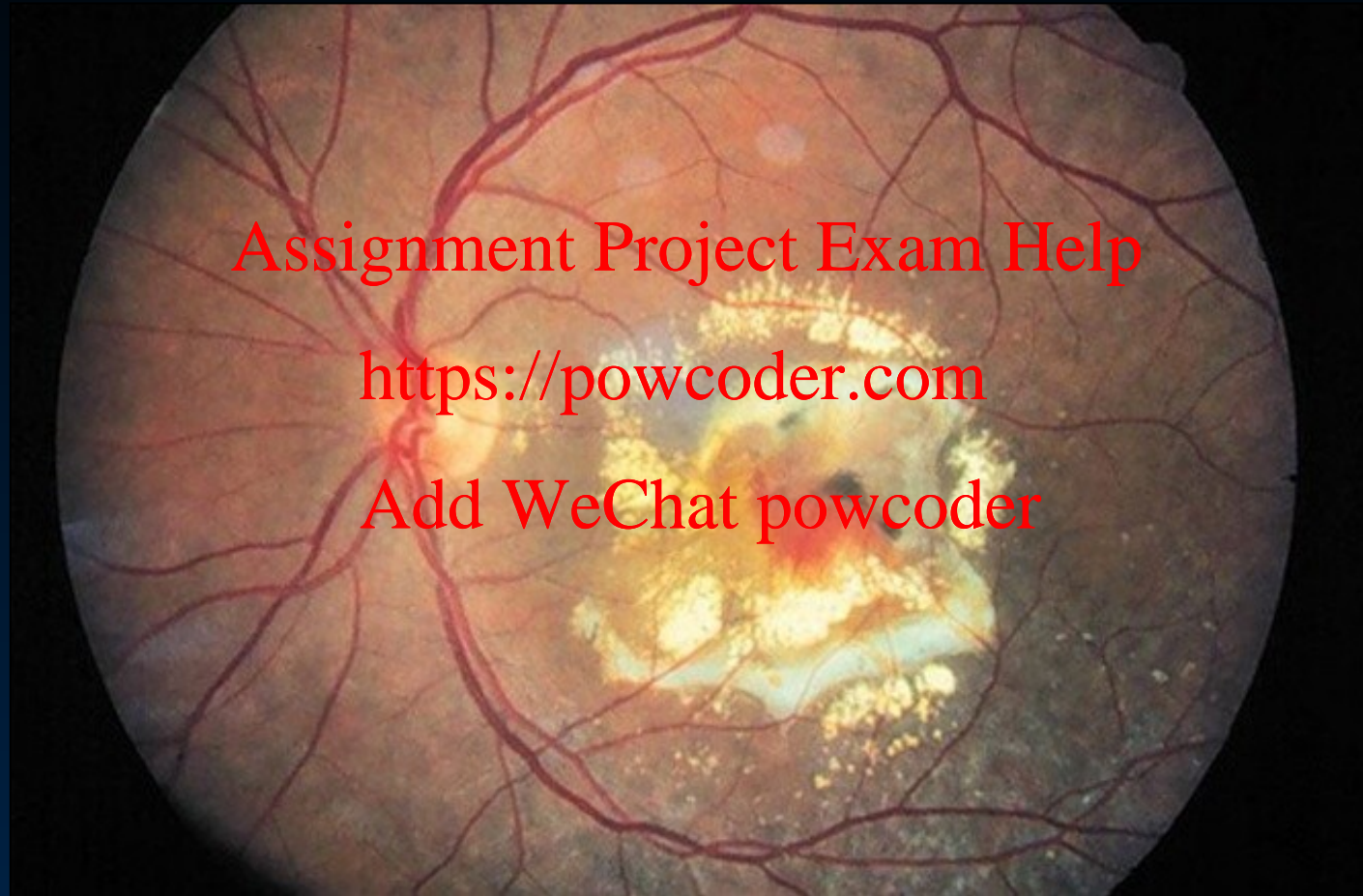
Human Retina



Dry AMD



Wet AMD



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Treatment of AMD

Nutritional (vitamins)

- Age-Related Eye Disease Study (AREDS)
- High-dose supplements of some antioxidants slows progression of AMD.

Intravitreal anti-VEGF injections

- VEGF = Vascular Endothelial Growth Factor
- Drugs injected into the eye inhibit the growth of destructive blood vessels.
 - Study demonstrating acuity improvement: Rosenfeld, P. J., et al. (2006). "Ranibizumab for neovascular age-related macular degeneration." *N Engl J Med* **355**(14): 1419-1431, Fig. 2A.

Regular physical activity vs. sedentary lifestyle is associated with reduced odds of onset of AMD and also progression to advanced AMD

Stem Cells

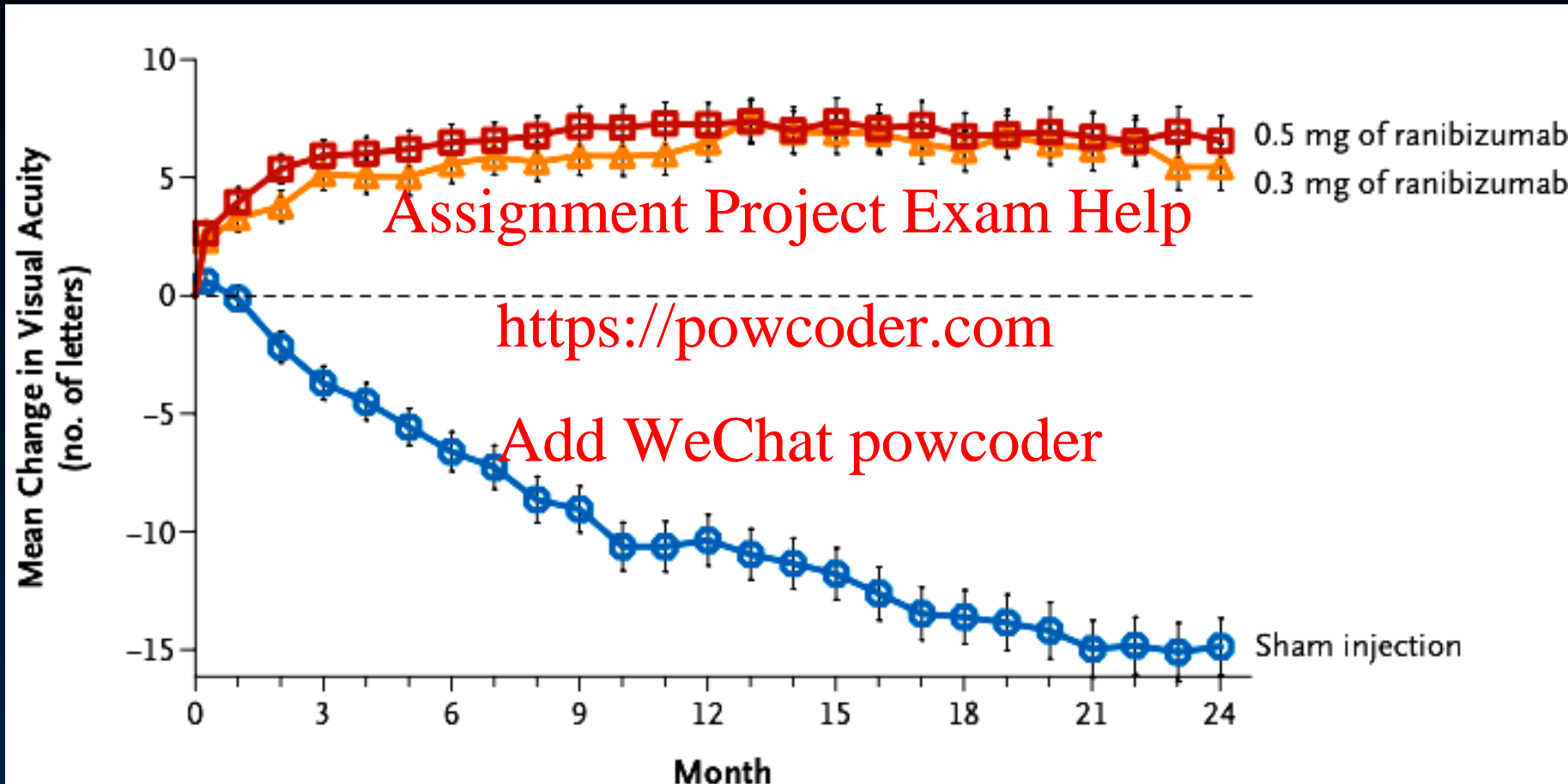
- Use of human embryonic stem cells to grow a thin layer of RPE cells
- Da Cruz et al. (2018). Phase 1 clinical study of an embryonic stem cell–derived retinal pigment epithelium patch in age-related macular degeneration. *Nature Biotechnology*.

Gene Therapy

- At least 50 genes involved in AMD

Retinal implants: restore light sensitivity in damaged central vision (Prima Vision)

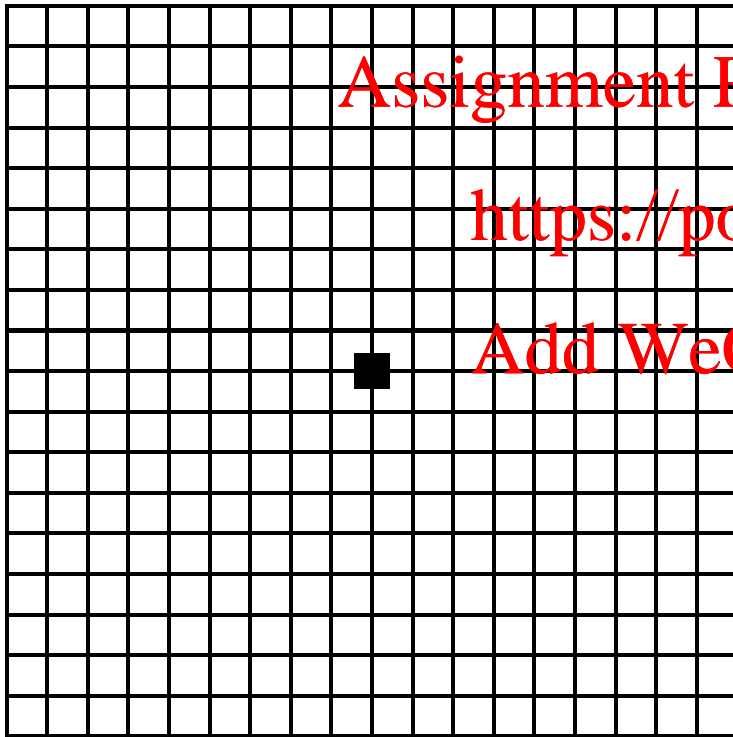
Lucentis Treatment for Wet AMD



Rosenfeld, P. J., et al. (2006). "Ranibizumab for neovascular age-related macular degeneration." *N Engl J Med* **355**(14): 1419-1431, Fig. 2A.

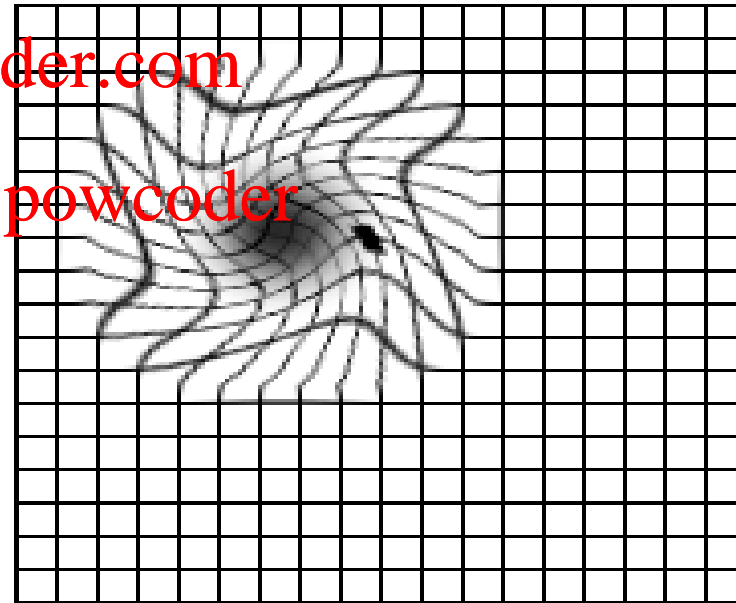
Amsler Grid

Amsler Grid



Amsler Grid

As it might appear to someone with age-related macular degeneration.

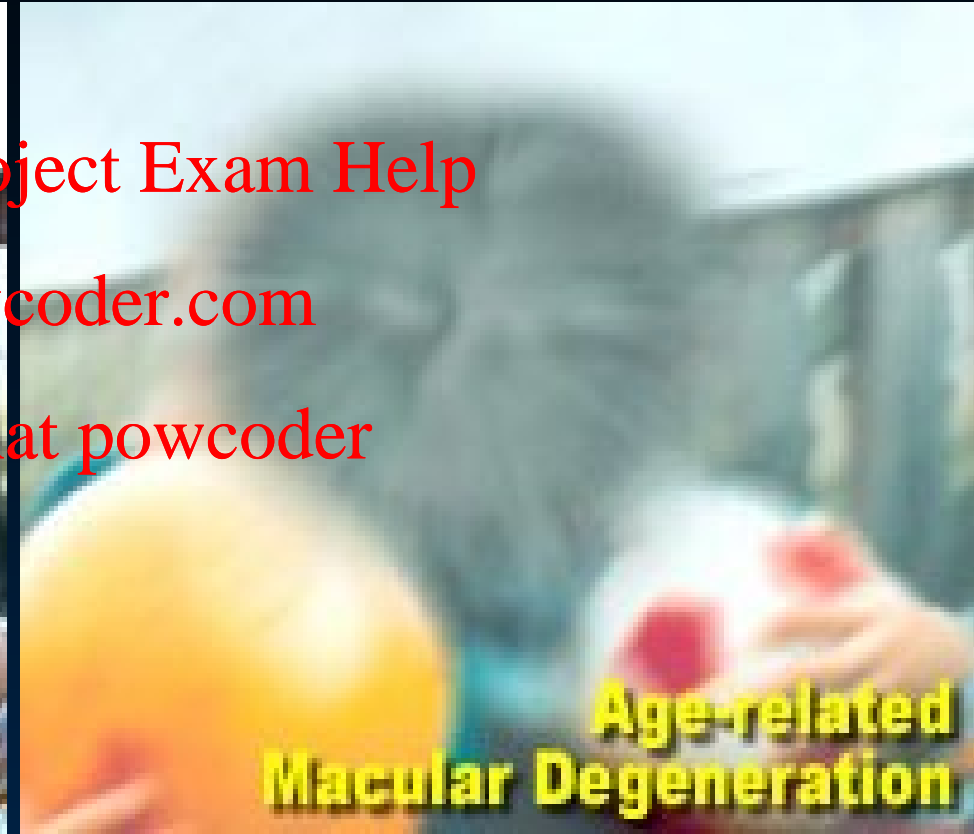
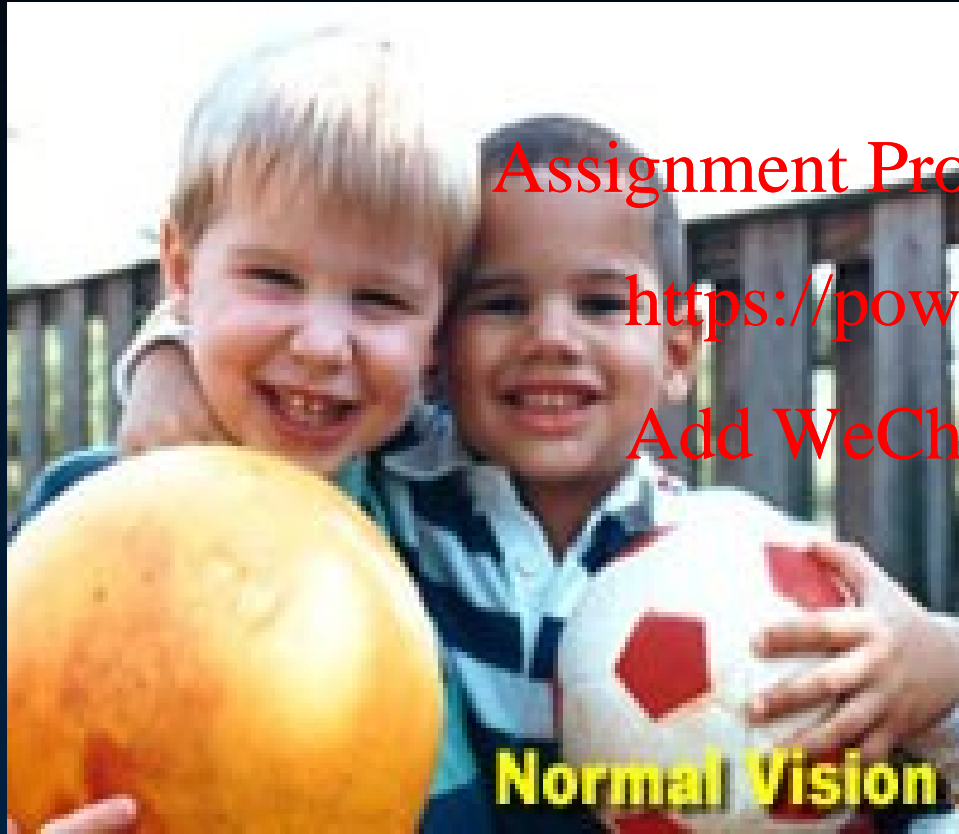


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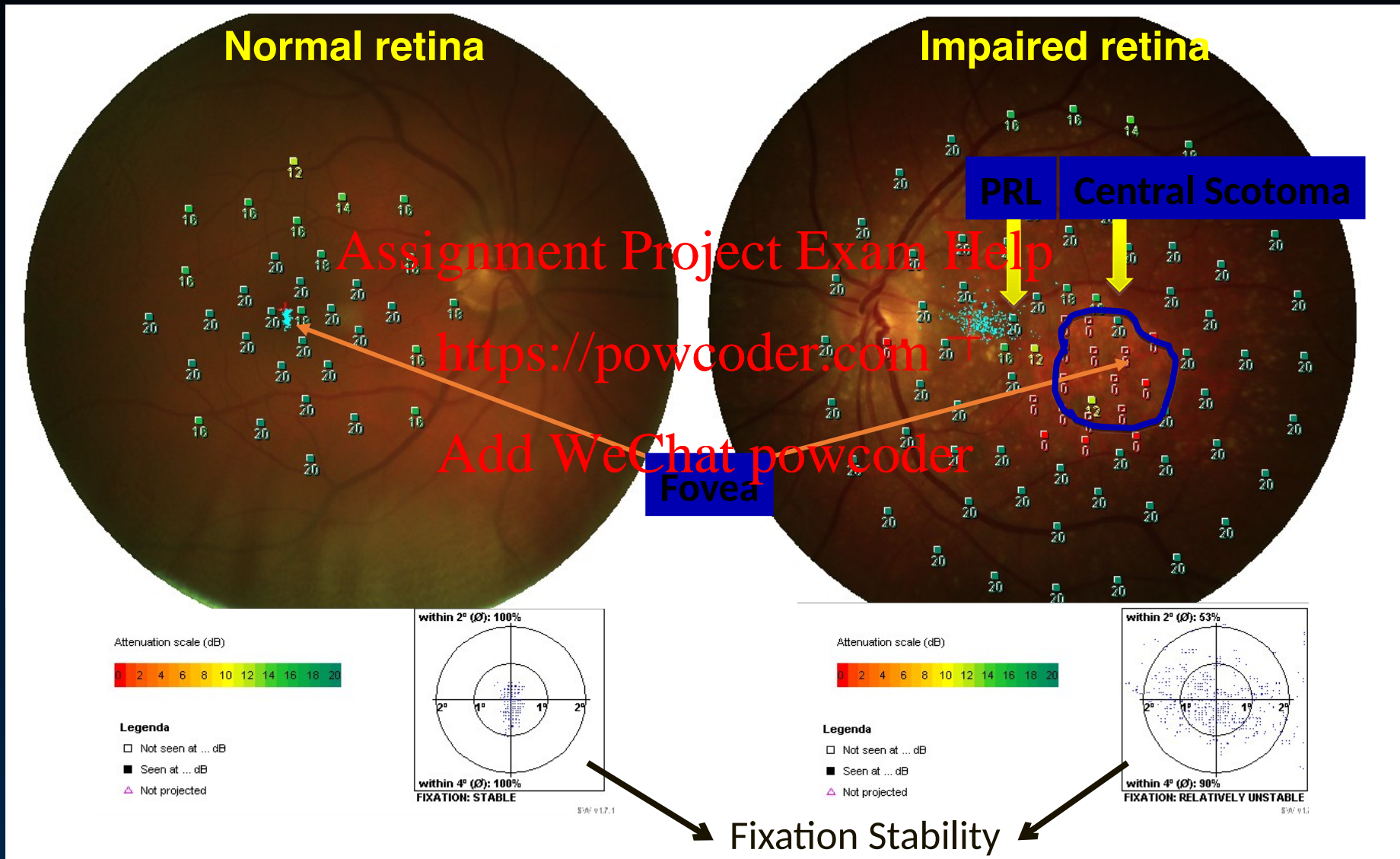
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Vision with AMD



Microperimetry – MP1



Some Perceptual Consequences of Central-Vision Loss

- Formation of a Preferred Retinal Location (PRL) and its use in fixation
- Lack of perceptual awareness of the central scotoma
- Reduced acuity and the need for magnification
- Impact on mobility?
- Charles Bonnet syndrome

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