

Assessment of the Rapid Dark Adaptation Test (RDAT) as a New Screening Technique for Macular Degeneration.

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Introduction

The basis for the RDAT is the occurrence of the Purkinje shift, a phenomenon where the peak wavelength sensitivity of the retina shifts from the red toward the blue end of the visual spectrum during the transition from photopic (cone mediated) to scotopic vision (rod mediated).

This shift causes the intensity, not the color, of blue to appear brighter than that of red under dim or scotopic lighting. The shift coincides with the onset of rod vision during the process of dark adaptation. In macular degeneration, the time for the rod-cone break point has been shown to be prolonged, delaying the onset of predominantly rod vision.

Objectives

- Assess the validity and reliability of the RDAT as a screening test for macular degeneration.
- Obtain a population sample to determine the variability of the results.

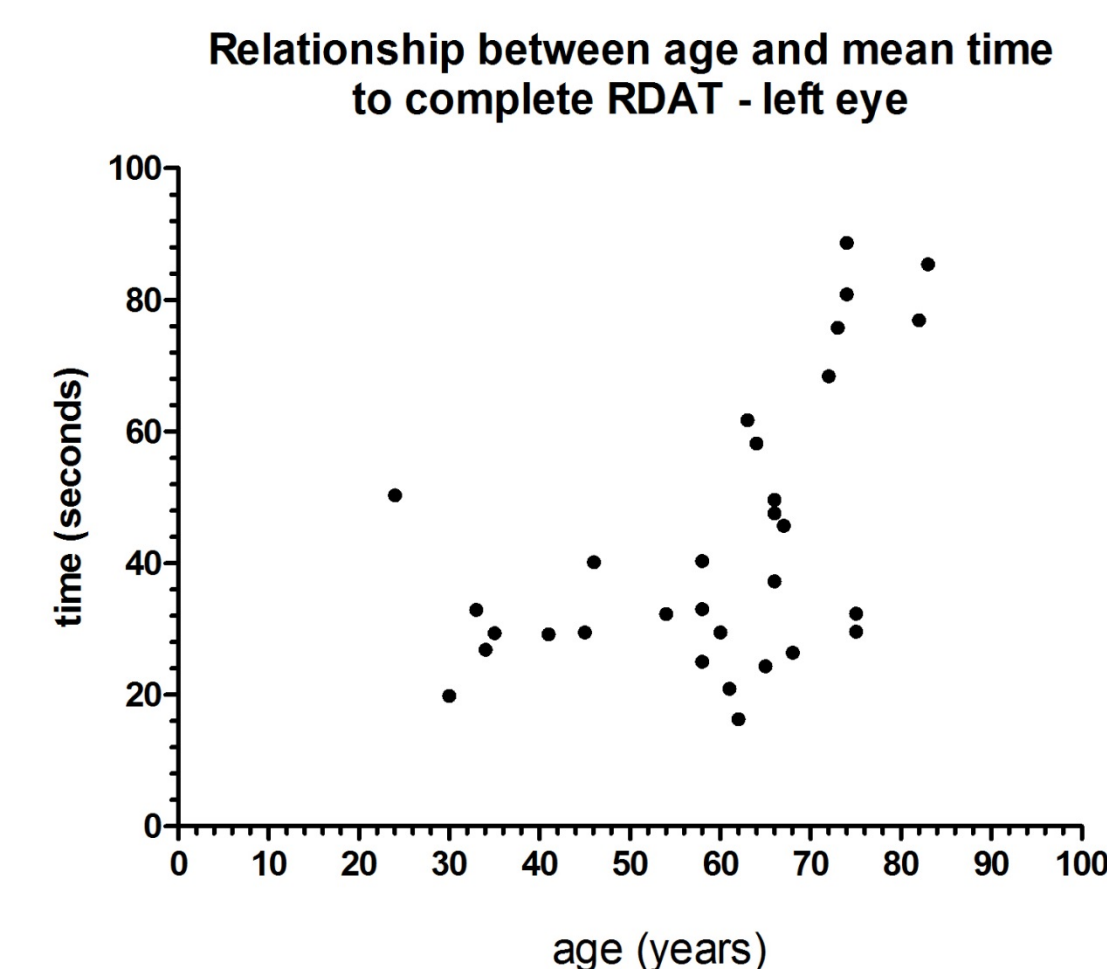
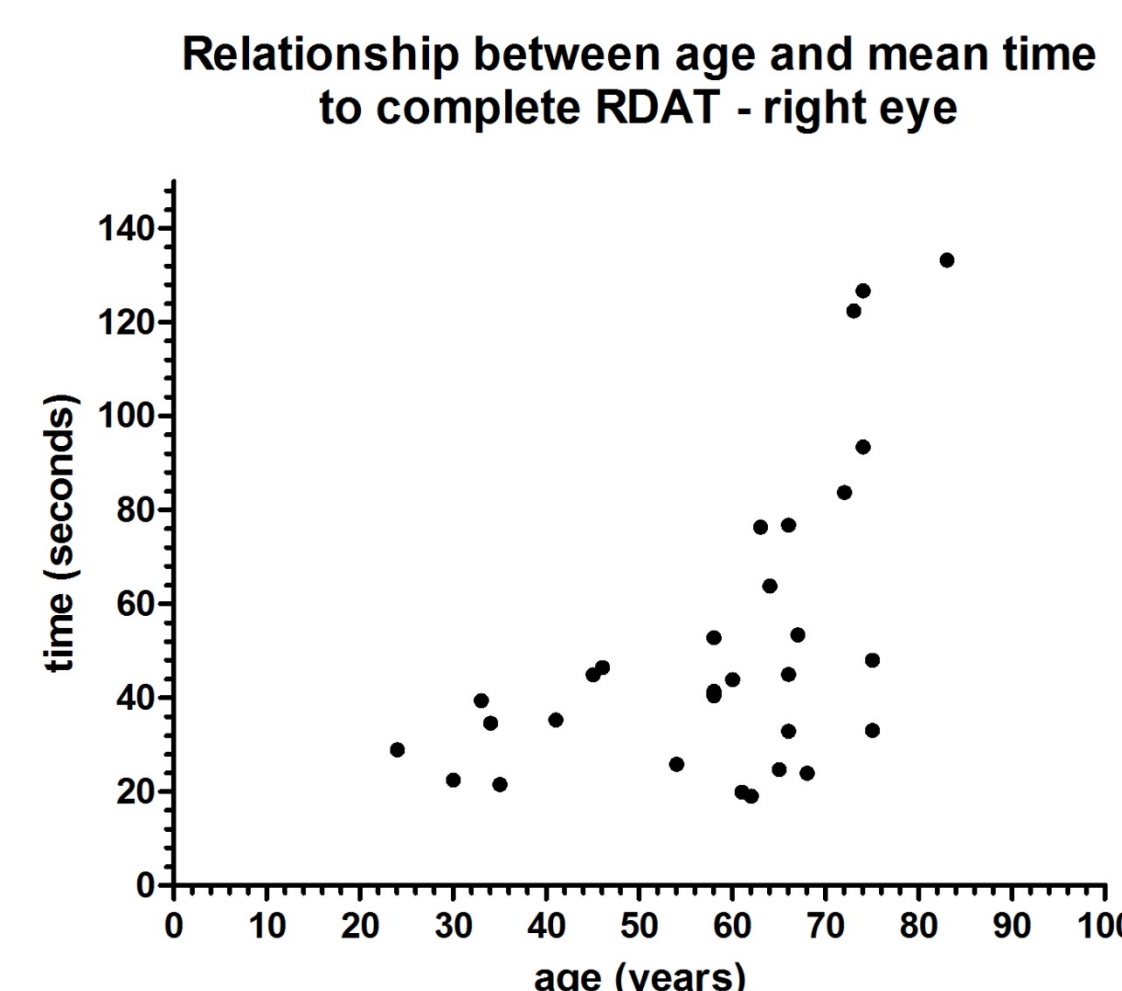
Methods

Enrollment for this study was comprised of 30 subjects free of retinal disease. Testing protocol:

1. Color vision is evaluated with Ishihara test plates
2. The subject is presented with a pile of colored discs (5 white, 6 blue, 7 red)
3. The subject's left eye is covered
4. The lights are turned off except for a computer monitor (brightness at 89 & contrast at 71)- the subject looks at it for a minute
5. The monitor is turned off (leaving only 0.002 foot lambert of illumination) and the subject is instructed to begin the test
6. He/she is to separate the discs by color- white is separated first, then blue
7. He/she signals when the white discs are separated and then says "stop" when all are separated
8. The timing is recorded
9. The same procedure is followed for the other eye
10. The test is performed 2 more times for each eye

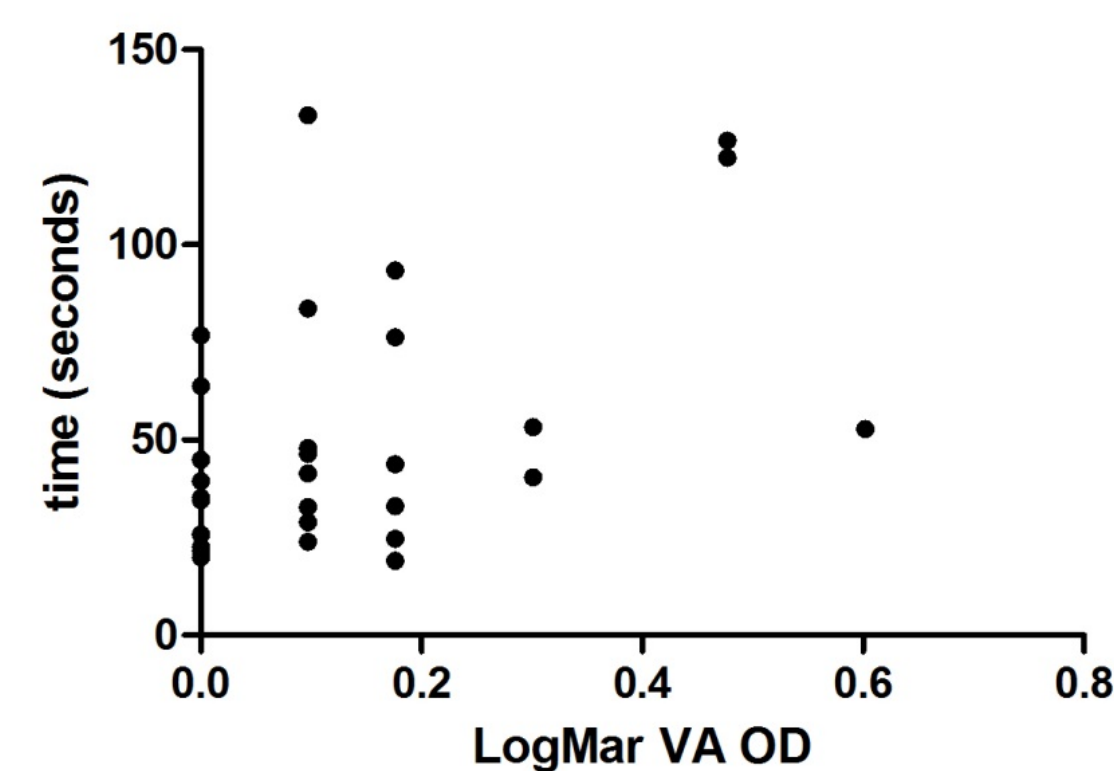
Results

Influence of Age on RDAT Completion Time

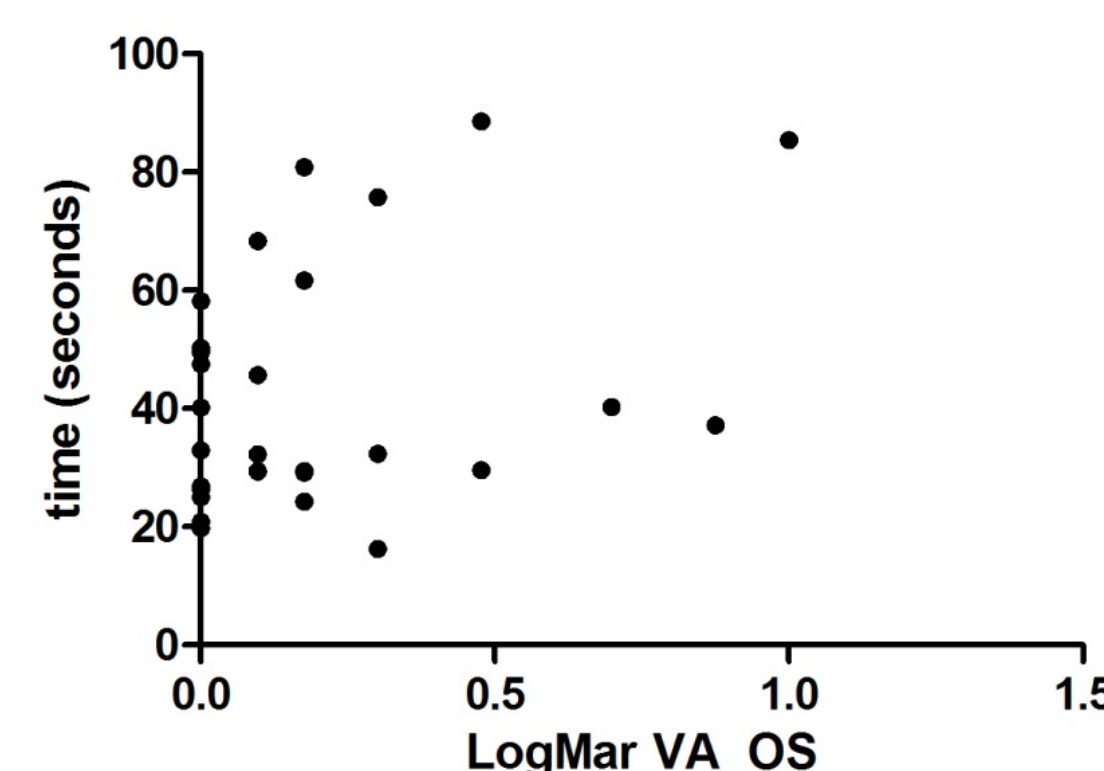


Influence of Vision on RDAT Completion Time

Mean time to complete RDAT vs. visual acuity right eye

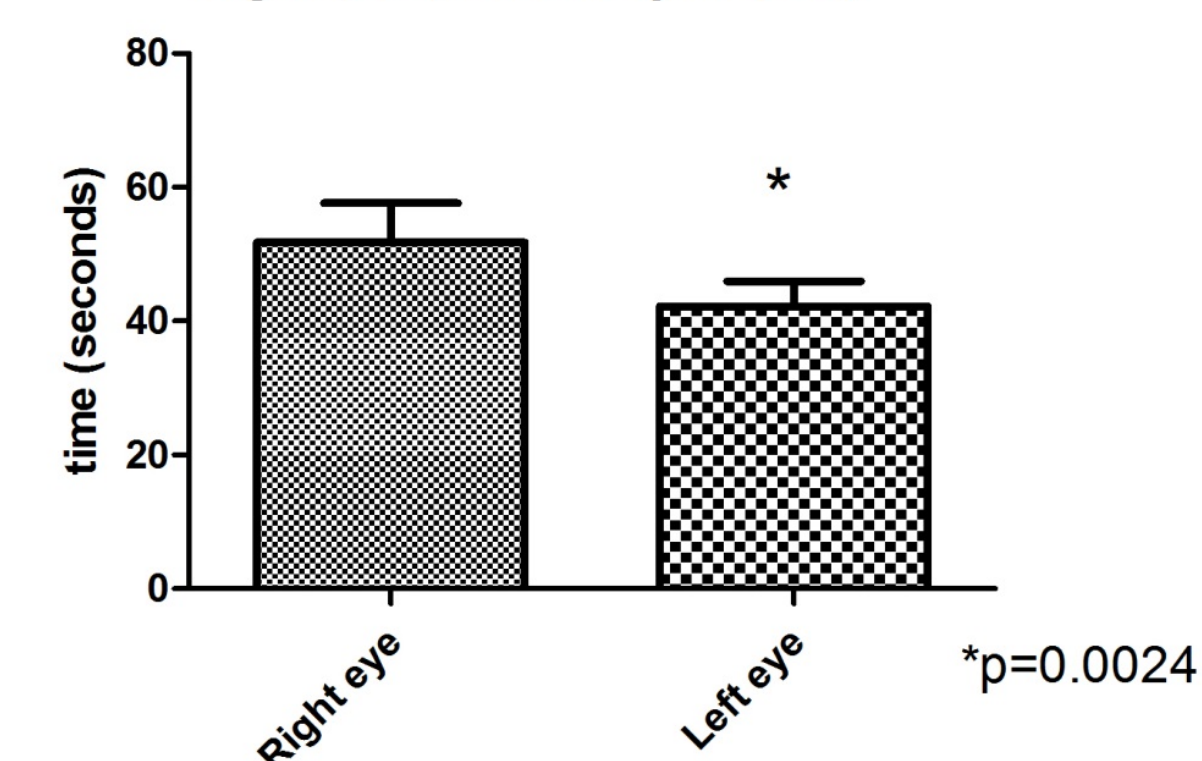


Mean time to complete RDAT vs. visual acuity left eye

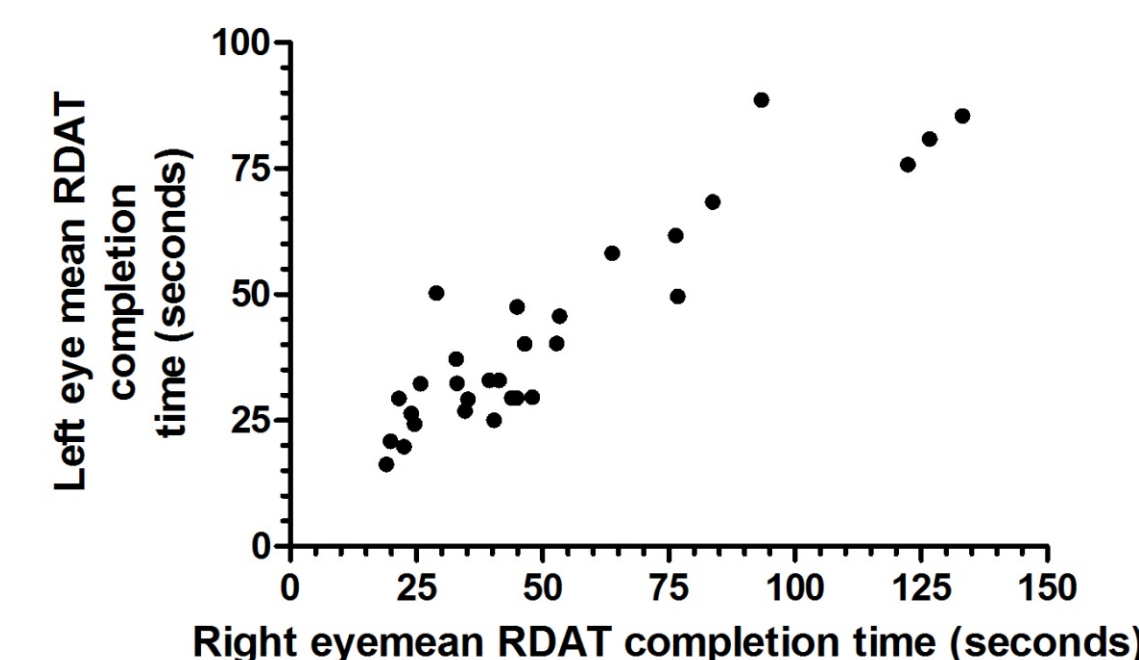


Influence of Test Order on RDAT Completion Time

Mean time required to complete RDAT: Right (OD) vs left eyes (OS)



Mean time to complete RDAT: Right vs left eyes



Age vs Test Duration by Trial

	OD		OS		Difference (OD - OS)	
	Age (r)	p	Age (r)	p	Age (r)	p
White Test						
Trial 1	.49	.01	.46	.01	.41	.02
Trial 2	.51	.004	.56	.001	.31	.09
Trial 3	.51	.004	.51	.004	.21	.27
Total Time	.53	.002	.53	.002	.45	.01
Blue Red Test						
Trial 1	.36	.046	.29	.11	-.01	.96
Trial 2	.49	.01	.39	.03	.12	.52
Trial 3	.51	.004	.35	.052	.36	.04
Total Time	.58	.001	.38	.04	.31	.09
Overall Test						
Trial 1	.53	.002	.50	.004	.38	.04
Trial 2	.59	.001	.53	.002	.39	.03
Trial 3	.55	.001	.48	.01	.42	.02
Total Time	.58	.001	.53	.002	.48	.01

Conclusions

- The study demonstrates a notable age dependent effect on the length of time required for the Purkinje shift, a finding that parallels similar findings for dark adaptation.
- These findings may be due to luminance differences, cognitive and perceptual motor issues in conducting the test and/or contribution from levels of vitamin A, a known contributor to rod function.
- There appears to be a notable learning effect in terms of speed of test completion as noted by the decrease in mean completion time between right vs left eyes.
- Further study will help delineate the usefulness of the RDAT to optimize AMD treatment subsequent to use of nutritional supplementation or other therapies intended to reduce disease risk.

References

AREDS Research Group. *Arch Ophthalmol* 119(10): 1417-36. 2001.
 Congdon NG et al. *Arch Ophthalmol* 122(4): 477-85. 2004.
 Owen CG, et al. *Brit J of Ophthalmol* 87: 312-317. 2003.
 Steinmetz, et al. *Brit J Ophthalmol* 77: 549-54. 1993.
 Thornton SP. *Ann Ophthalmol* 9: 731-4. 1977.
 Vinton NE and Russell RM. *Am J Clin Nutr* 34: 1961-6. 1981.