Age-Associated Changes in a Measure of Visual Function in Companion Dogs

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Background: Companion dogs live in ~45% of U.S. homes. And, like people, dogs experience aging and age-related conditions, including brain disorders and a decline of the senses, but on a much shortened timeline. Vision is a critical sense that is affected by aging. And, poor vision is linked to more severe brain disorders in older people. Our research program thinks that companion dogs and their people share risk factors for age-related brain disorders and decline of the senses.

Specific Aim: Determine the relationship between dog age and a measure of vision function, the retinal full-field electroretinogram (ERG).

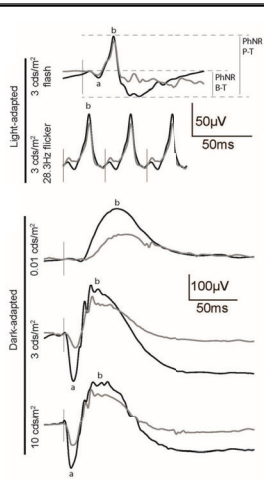
Methods: Healthy adult companion dogs with no major eye issues were included.

Demographics of study dogs	
Age in months, median (interquartile range)	94 months (62 – 124 months)
Female, n (%); Male, n (%)	46 (53%); 41 (47%)
Weight in kg, median (interquartile range)	26.1 kg (17.1 – 31.2 kg)
Purebred, n (%); Mixed breed, n (%)	47 (54%); 40 (46%)

Full-field light-adapted and dark-adapted ERGs were performed on the clearest eye using a handheld device, with dilation of the pupil and topical anesthesia.

Figure 1. Photos of ERG electrodes placement (A) and light-adapted ERG being performed in a study dog (B).

Results:



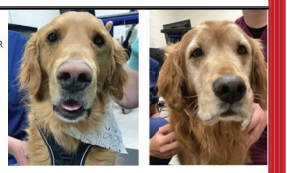


Figure 2. Example ERG tracings from purebred Golden Retriever female (spayed) dogs. Dog 1 (black lines) is aged 34 months (2.8 years), body weight 35.2 kg, and based on maximum lifespan calculations, was 24% of median published Golden Retriever lifespan. Dog 2 (gray lines) is aged 126 months (10.5 years), body weight 32.1 kg, and based on maximum lifespan calculations, was 89% of median published Golden Retriever lifespan.

Like older people, older companion dogs have poorer retinal function, likely indicating lower vision ability.

The QR code will take you to the complete abstract.

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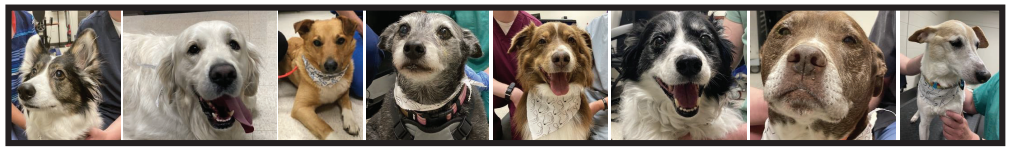
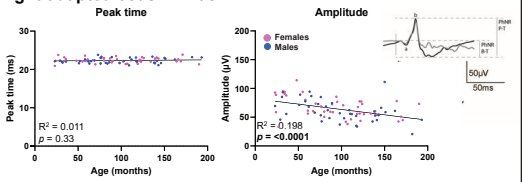


Results (continued):

Light-adapted 3cds/m² flash



Light-adapted 3cds/m² 28.3Hz flicker

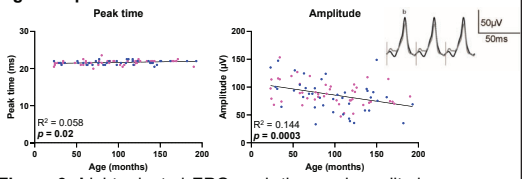
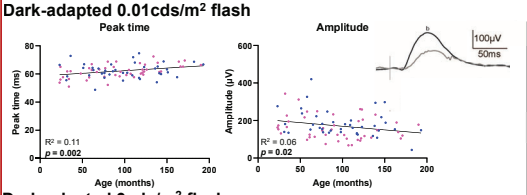
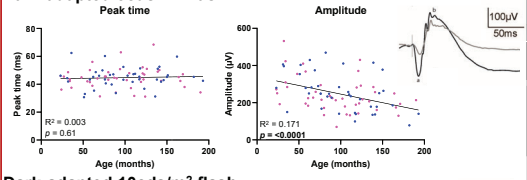


Figure 3. Light-adapted ERG peak time and amplitude measures and their relationship with age. R^2 and *p* values reflect analyses (simple linear regression) performed on age and ERG outcome variable.

Dark-adapted 0.01cds/m² flash



Dark-adapted 3cds/m² flash



Dark-adapted 10cds/m² flash

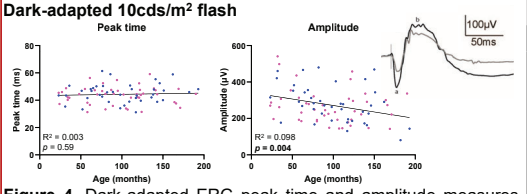


Figure 4. Dark-adapted ERG peak time and amplitude measures and their relationship with age. R^2 and *p* values reflect analyses (simple linear regression) performed on age and ERG outcome variable.

Future Direction: Examine the relationship between vision decline and brain disorders in aging dogs to establish if a similar relationship found in people is present in this companion species.

Defining parallels between dogs and people may allow us to use dogs as relevant models for interventions aimed at improving and maintaining brain and vision function in older people.

References:

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3. A. Runk *et al.* (2023) Associations between visual acuity and cognitive decline in older adulthood: A 9-year longitudinal study. *J Int Neuropsychol Soc*, 29(1):1-11.