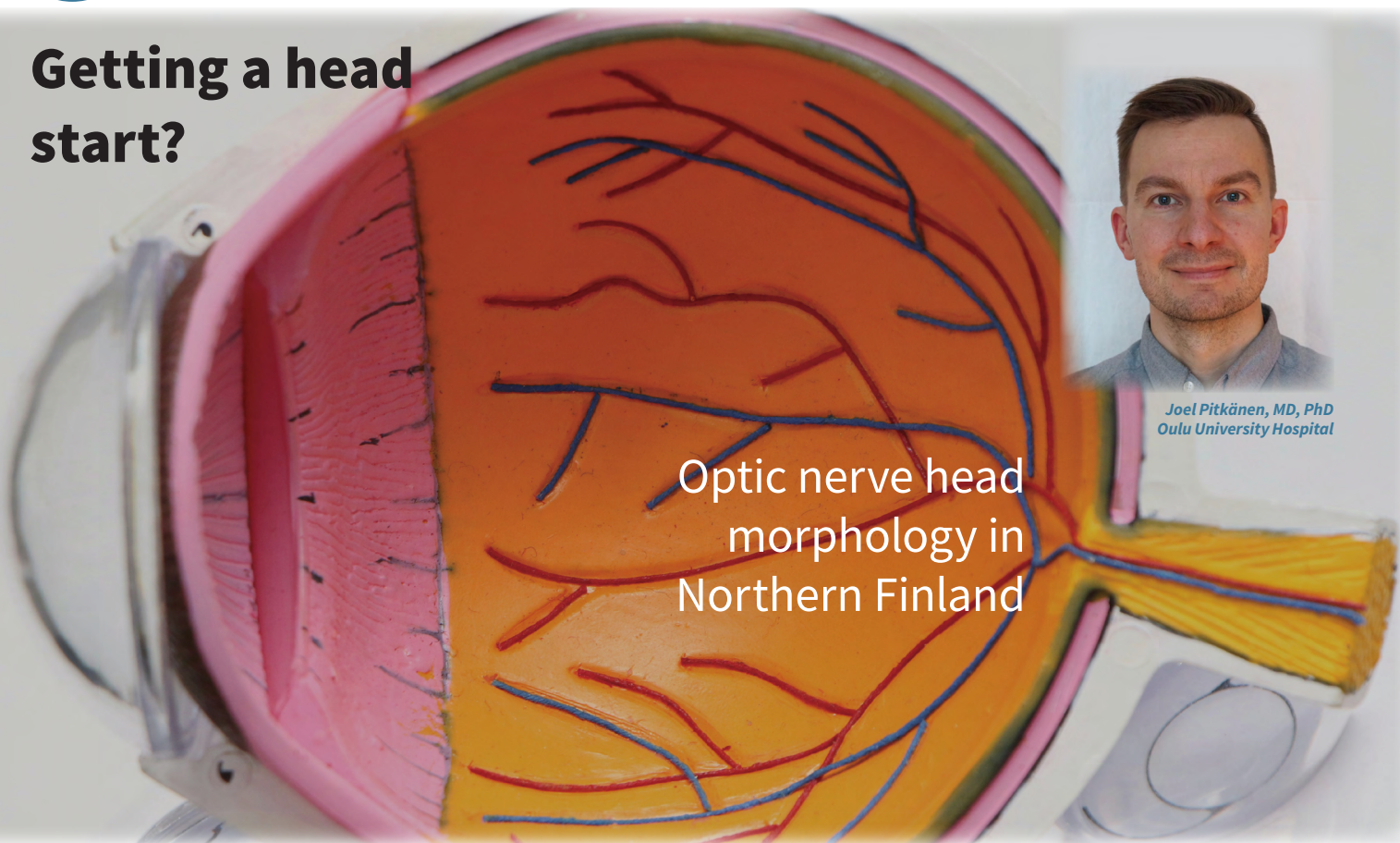# Getting a head start?

Optic nerve head morphology in Northern Finland

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On November 10, 2023, Joel Pitkänen defended his thesis "Morphology of the optic nerve head and the retinal nerve fiber layer and factors affecting them in the Northern Finland Birth Cohort Eye study" at the University of Oulu, Finland. The PhD project was conducted at the Dept. of Ophthalmology, Oulu University Hospital. His supervisor was Ville Saarela, docent, Dept. of Ophthalmology, Oulu University Hospital.

This dissertation aimed to explore the factors that may affect the morphology of the optic nerve head (ONH) and the retinal nerve fiber layer (RNFL) in the Northern Finland Birth Cohort, including perinatal factors, physiological and anatomical factors, and cognition.

The Heidelberg Retina Tomograph 3 was used to measure ONH morphology, and optical coherence tomography was employed to measure the average peripapillary RNFL thickness. We used the paired associates learning test, grade point average, level of education, and standard automated perimetry as surrogates for cognition. Concerning perinatal factors, we explored data on maternal illness, medication, smoking, and physiological and newborn measurements. Additionally, anatomical measurements of the body, eye, and blood pressure were performed for participants aged 45–49 years.

Neuroretinal rim volume was correlated with faster automated perimetry performance, fewer errors in the paired associates test, and a higher grade point average. A thicker RNFL was correlated with faster performance in the automated perimetry test. Maternal chronic pulmonary disease and highest systolic blood pressure, weeks of gestation, and birth length all correlated with ONH morphology. Notably, the disc area substantially correlated with the other parameters of ONH morphology and RNFL. The effects of other ocular, anatomical, and physiological factors were weak.

Although we found many statistically significant correlations, most were of limited predictive value. The ONH seems to be well-protected during pregnancy. Greater RNFL thickness, disc area, and rim volume might enable better performance in cognitive tests. The physiological and anatomical factors outside the eye do not seem to substantially affect the morphology of the ONH and can be ignored in clinical work.

Remaining questions:

- Do some anatomical and functional properties of the visual tract enable higher cognitive traits?
- Is glaucoma diagnosis more accurate if more regional reference databases are used?

Key points:

- Greater retinal nerve fiber layer thickness, disc area, and rim volume might enable better performance in cognitive tests.
- The optic nerve head seems to be well-protected during pregnancy.
- The physiological and anatomical factors outside the eye do not seem to substantially affect the morphology of the optic nerve head and can be ignored in clinical work.

References

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2. Pitkänen J, et al. Antenatal and neonatal factors and morphology of the optic nerve head in the Northern Finland birth cohort. *Acta Ophthalmol.* 2022 Dec;100(8):e1657-e1664.
3. Pitkänen J, et al. Morphology of the optic nerve head and factors affecting it in the Northern Finland birth cohort. *Acta Ophthalmol.* 2023 Aug;101(5):575-581.