Optometry / Bachelor´s thesis

The influence of age on the intraocular pressure of the human eye

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Introduction

With increasing age, structural and functional changes occur in the eye that may influence intraocular pressure (IOP). Degenerative processes in the trabecular meshwork and the uveoscleral outflow pathways can lead to reduced aqueous humor drainage and may contribute to elevated IOP. Since increased IOP is a major risk factor for glaucoma, understanding age-related changes is of high clinical relevance. However, IOP is influenced by multiple factors, including genetics, systemic conditions, and circadian variations. Previous studies have reported conflicting results, showing either an increase[1,2], decrease[3,4], or no significant association between age and IOP[5,6]. In addition, central corneal thickness (CCT), which is essential for accurate IOP interpretation, may also be affected by age and population-specific factors.

Purpose

The aim of this study was to investigate whether age has a significant influence on intraocular pressure and central corneal thickness. Due to conflicting results from previous studies, this study seeks to provide further evidence and contribute to a better understanding of age-related changes in ocular parameters across different populations.

Material and Methods

The retrospective, quantitative, non-interventional cross-sectional study included 190 subjects from an optometry practice in the Seychelles (2025) and 237 subjects from previously unpublished data collected by Petermann and Wildgrube in Germany (2010)[7]. Intraocular pressure was measured using non-contact tonometry at both locations, while optical coherence tomography was additionally used in Germany to assess central corneal thickness (CCT). Statistical analysis was performed separately for each population.

Results

A significant negative correlation between age and intraocular pressure was observed in the German cohort ($p < 0.001$; $r = -0.226$), indicating a slight decrease in IOP with increasing age *(Fig. 2)*. In contrast, no significant correlation was found in the Seychelles population ($p = 0.709$; $r = 0.027$) *(Fig. 1)*.
Furthermore, no significant association between age and central corneal thickness (CCT) was identified at either location (Seychelles: $p = 0.506$; $r = -0.049$; Germany: $p = 0.287$; $r = -0.069$) *(Fig. 3, 4)*.
Descriptive analysis showed that participants in the Seychelles had a mean age of 44.63 years (SD ±15.78), a mean intraocular pressure of 14.87 mmHg (SD ±2.42), and a central corneal thickness of 524.83 µm (SD ±30.34). In the German cohort, the average age was higher at 51.63 years (SD ±20.57), with a mean intraocular pressure of 17.65 mmHg (SD ±2.84) and a slightly greater central corneal thickness of 539.75 µm (SD ±33.46).

Conclusion

The findings of this study suggest that the relationship between age and intraocular pressure is not universal but may depend on population-specific factors such as ethnicity, environmental influences, and measurement conditions. While a significant negative correlation was observed in the German population, this was not confirmed in the Seychelles cohort.
These results are consistent with the heterogeneous findings reported in the literature and further highlight the lack of a generalizable age-related trend in intraocular pressure. The age-related increase in glaucoma prevalence therefore cannot be explained by a general increase in intraocular pressure alone.
Additionally, no significant relationship between age and central corneal thickness was identified. Consequently, clinical assessment of intraocular pressure should always consider individual patient factors rather than relying on age-related expectations.

References

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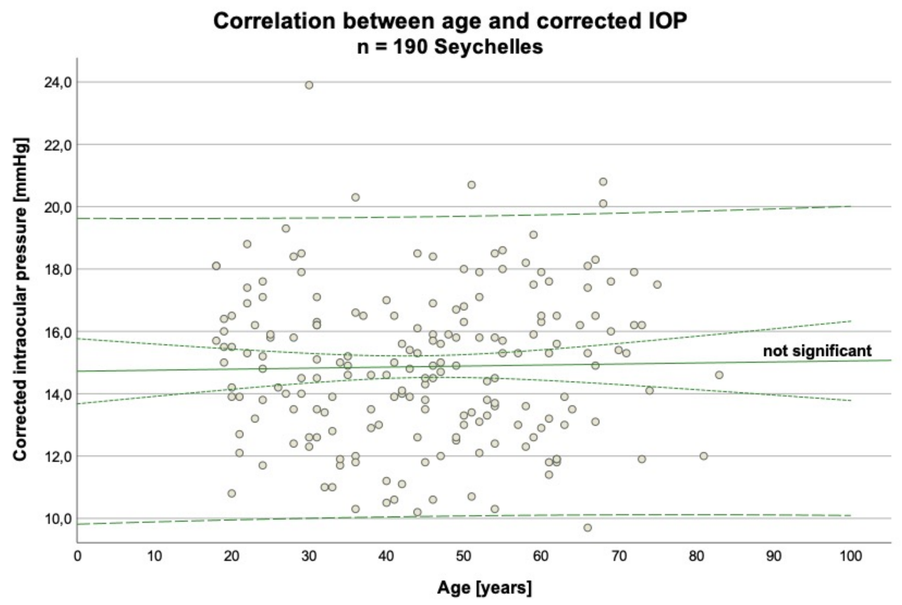


Figure 1: Correlation between age and IOPcc. The green lines show the linear regression line (solid line), the 95% confidence interval (fine dashed lines), and the 95% prediction interval (coarse dashed lines).

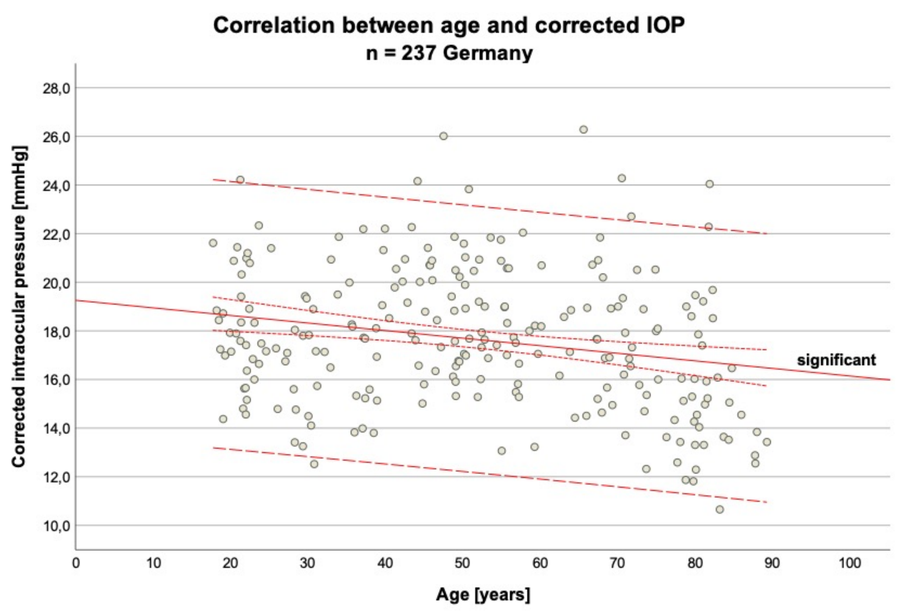


Figure 2: Correlation between age and IOPcc. The red lines show the linear regression line (solid line), the 95% confidence interval (fine dashed lines), and the 95% prediction interval (coarse dashed lines).

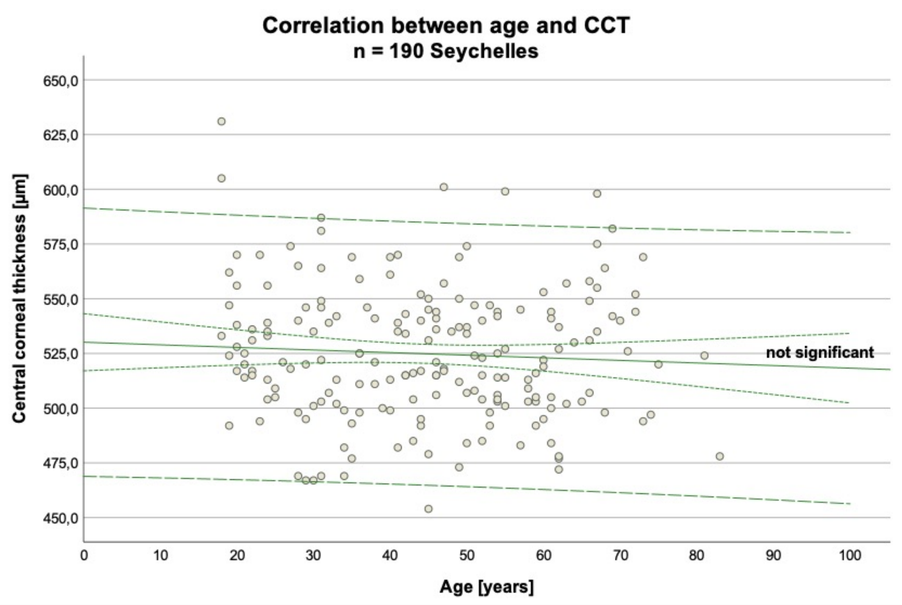


Figure 3: Correlation between age and CCT. The green lines show the linear regression line (solid line), the 95% confidence interval (fine dashed lines), and the 95% prediction interval (coarse dashed lines).

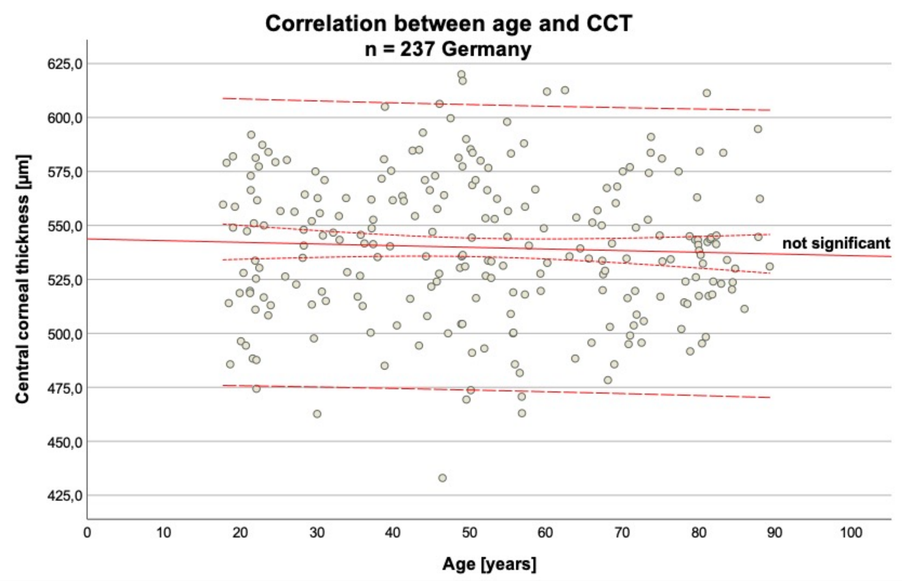


Figure 4: Correlation between age and CCT. The red lines show the linear regression line (solid line), the 95% confidence interval (fine dashed lines), and the 95% prediction interval (coarse dashed lines).

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