

Early Identification of Alzheimer's Disease

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overall

- Importance of early identification
- Idea to design biosensor

Characteristics
mechanisms

transform

Signals for
biosensor to
detect

- Traditional Neuropsychological
- Metacognitive
- Digital Cognitive
- Digital Behavioral

Convenience
vs Challenges

{ reliability
Accuracy
“sensitivity”

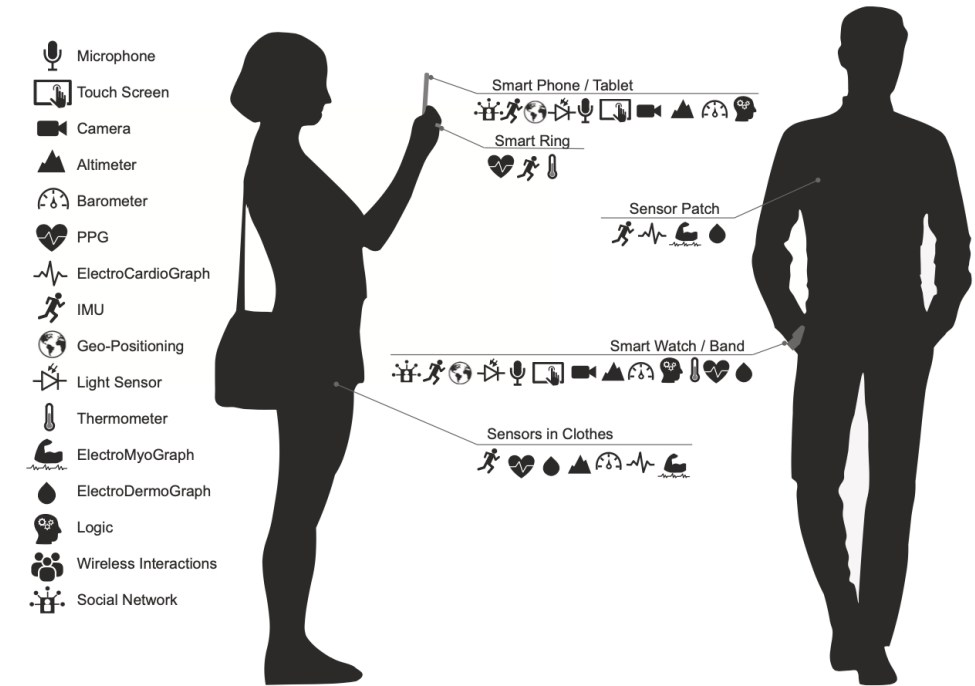


Fig 1. portable sensor of **digital biomarkers**

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[2] Florean, I et al. (2021). Using the ATN system as a guide for the neuropsychological assessment of Alzheimer's disease. Journal of Clinical and Experimental Neuropsychology, 43(9), 926–943. <https://doi.org/10.1080/13803395.2022.2036327>.

Giovanni Augusto Carlesimo, & Stefania, M. (2023). Special issue on "Novel neuropsychological instruments for the prodromal and preclinical diagnosis of Alzheimer's disease". Neuropsychology, 37(6), 623–627. <https://doi.org/10.1037/neu0000907>

[3] Kourtis, L. C., Regele, O. B., Wright, J. M., & Jones, G. B. (2019). Digital biomarkers for Alzheimer's disease: the mobile/wearable devices opportunity. *Npj Digital Medicine*, 2(1). <https://doi.org/10.1038/s41746-019-0084-2>

APP
PSEN1
PSEN2

Early-onset

APOE

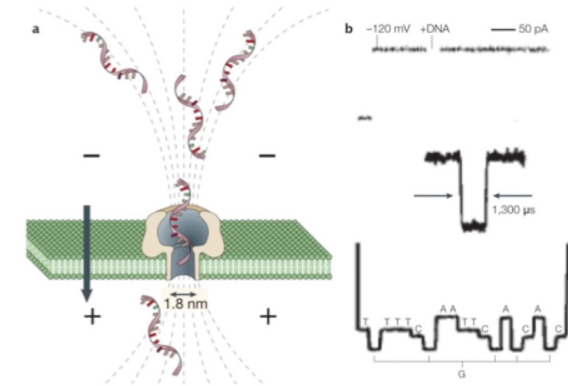
Late-onset

DNA sequencing...

Gene

+

Environment



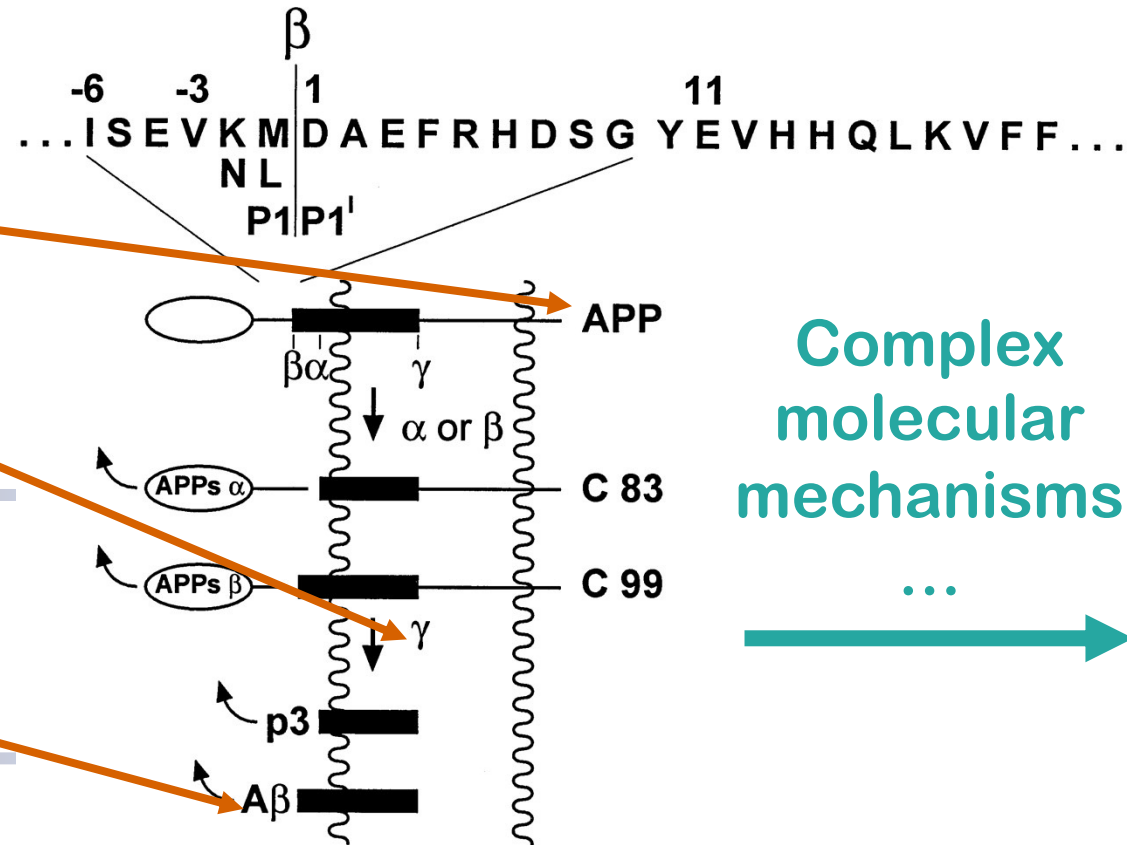
**Alzheimer's
Disease**

APP**PSEN1****PSEN2**

Early-onset

APOE

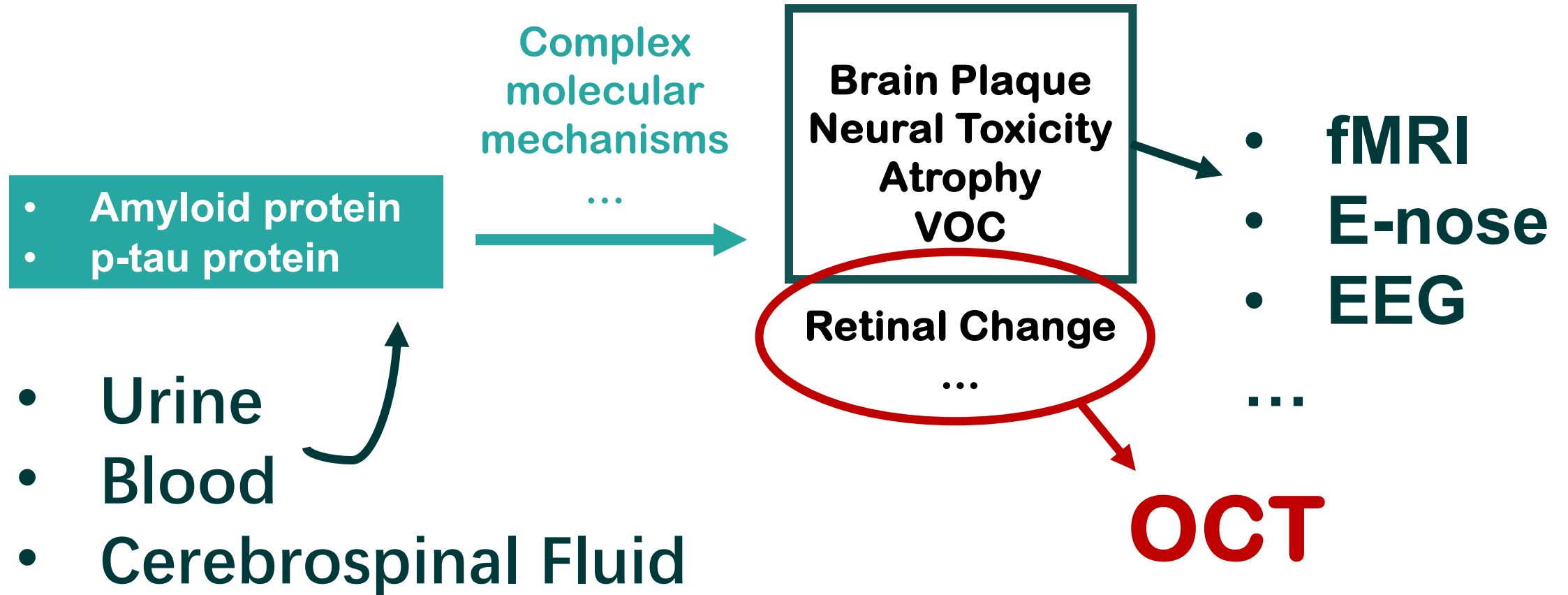
Late-onset

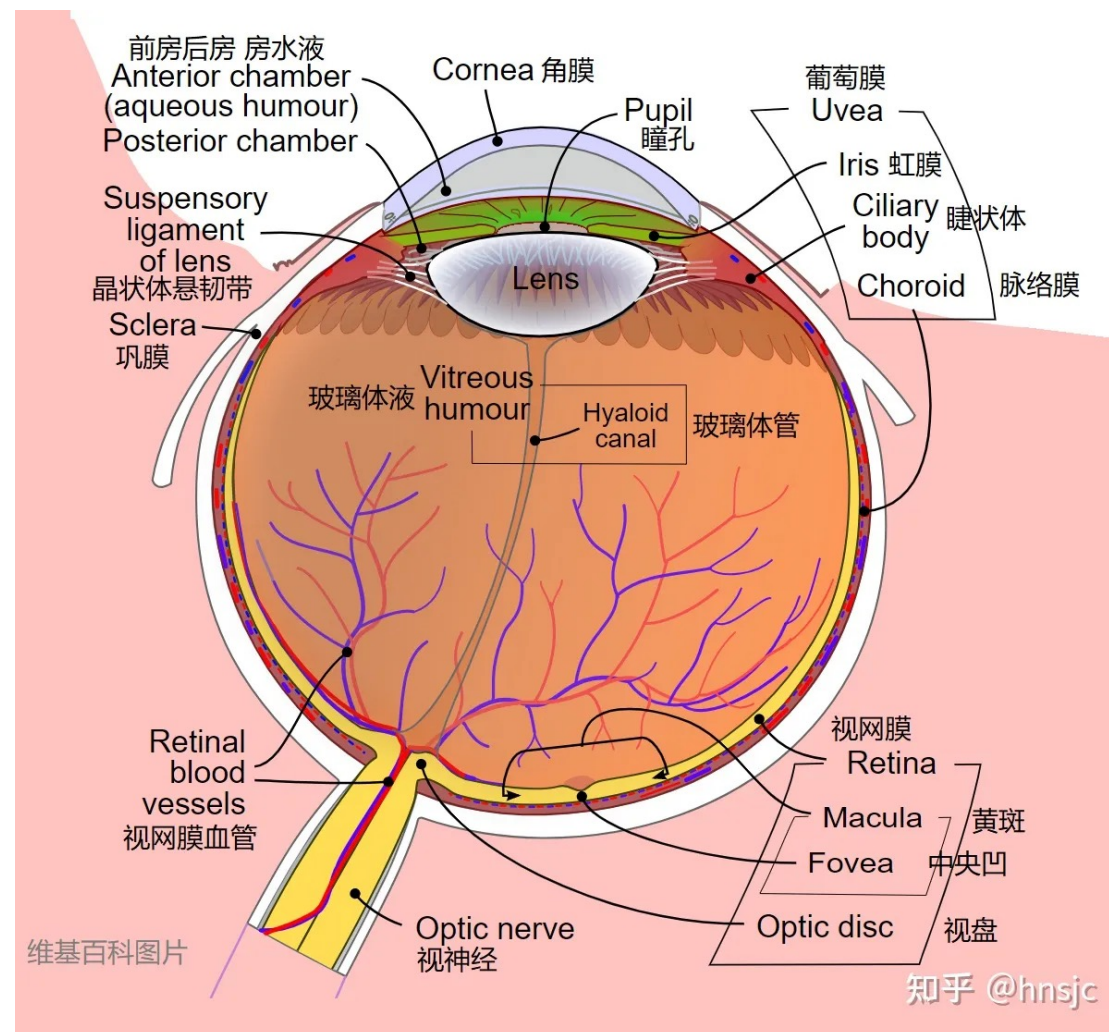


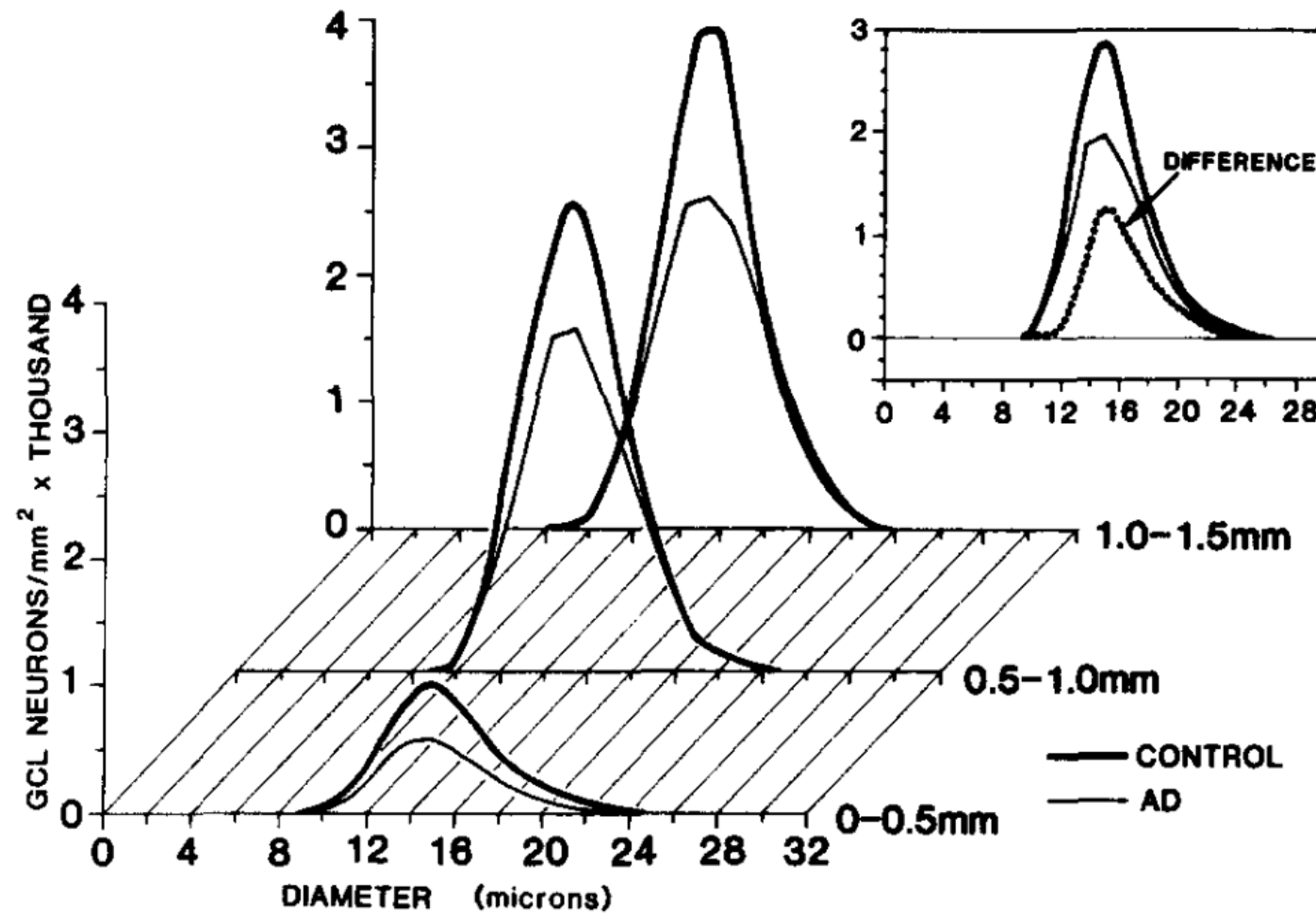
Complex
molecular
mechanisms
...

Brain Plaque
Neural Toxicity
Atrophy
Retinal Change
...

- Amyloid protein
- p-tau protein

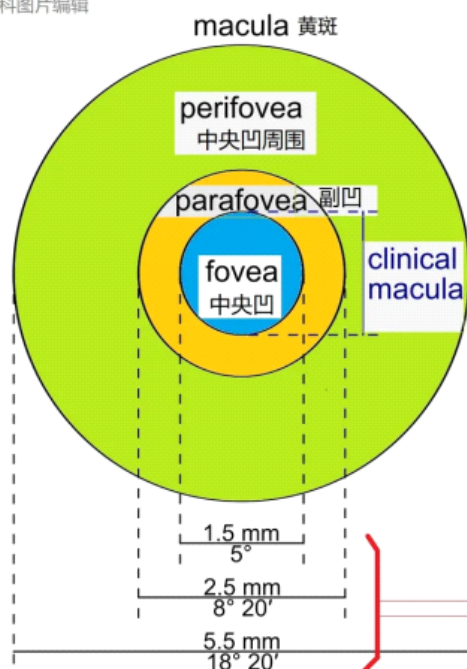




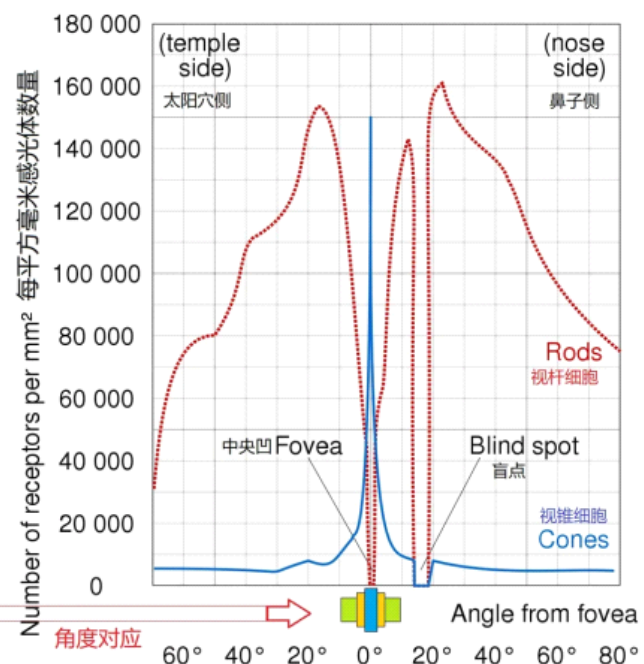


使用维基百
科图片编辑

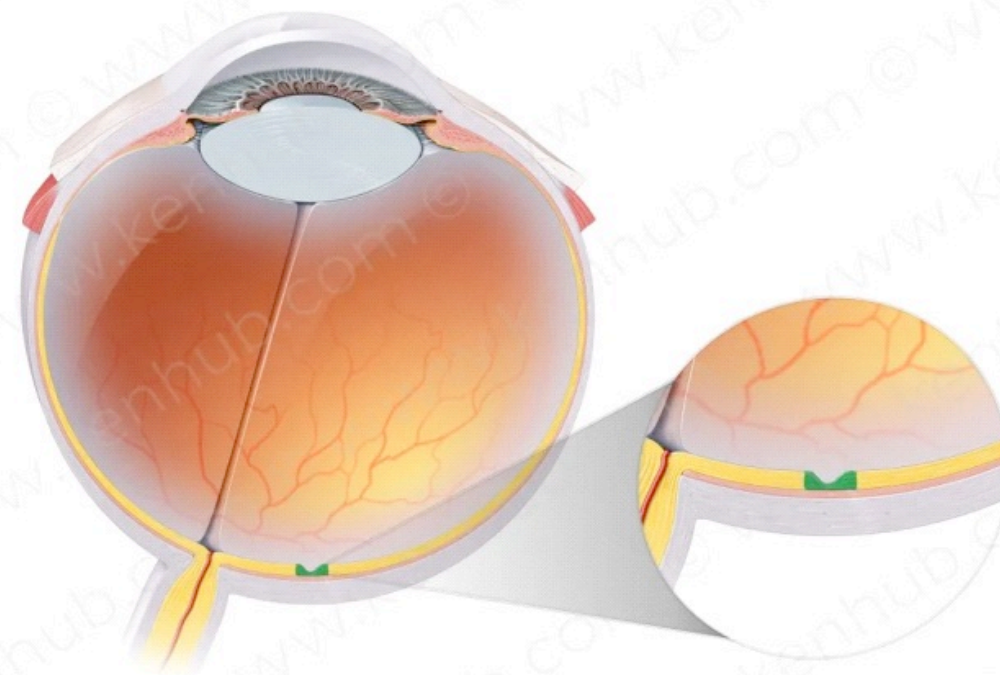
视网膜黄斑区域结构及感光细胞分布图

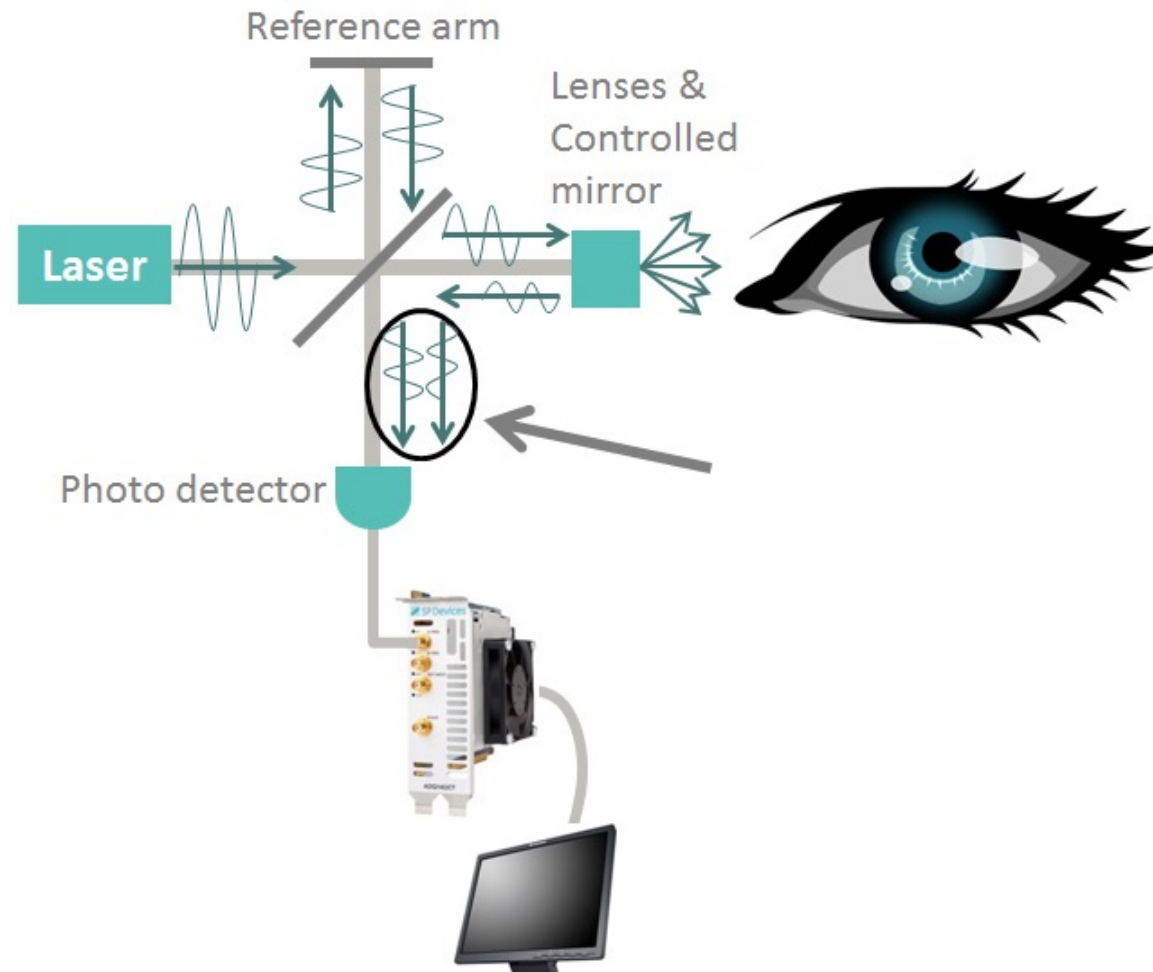


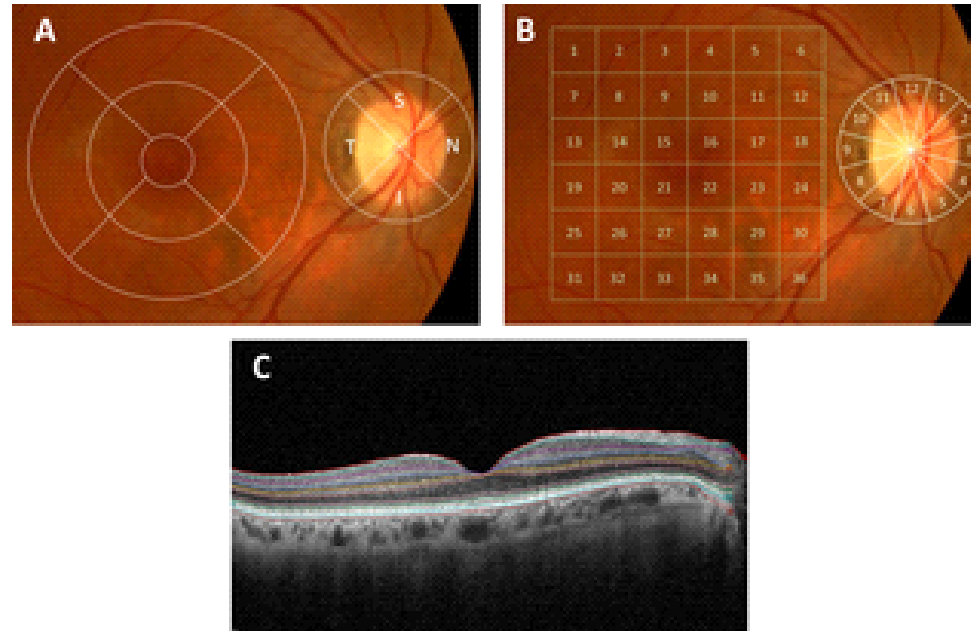
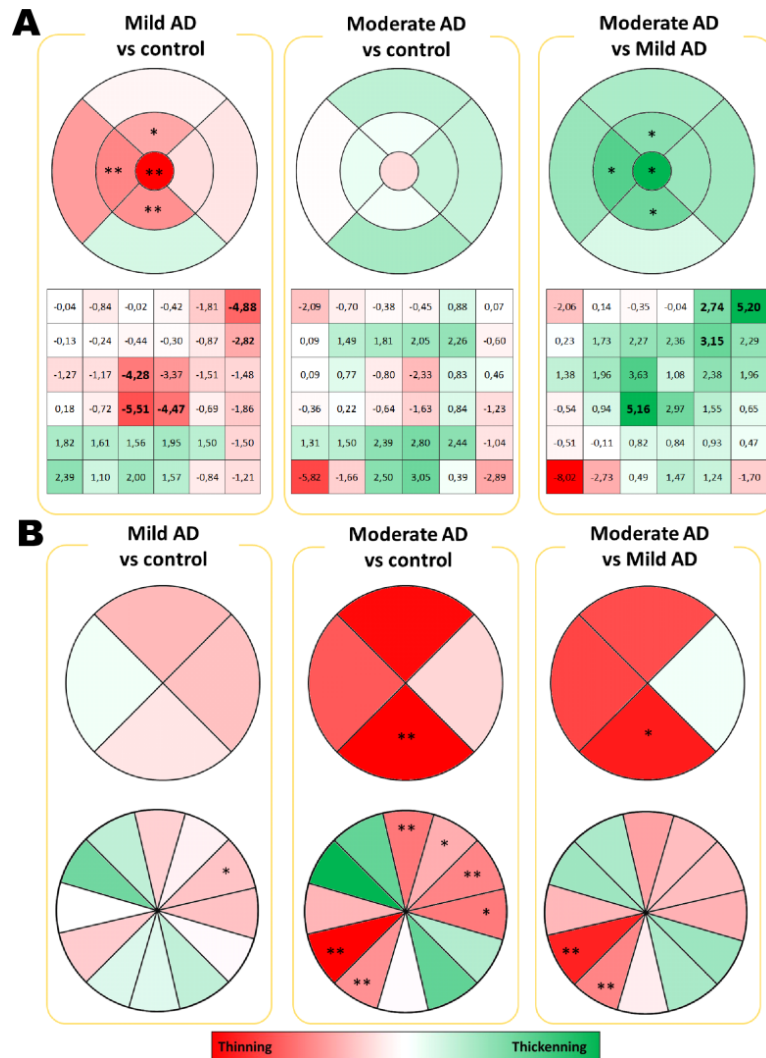
A 黄斑及中央凹尺寸



B 中心到周围感光体分布







Visual acuity, contrast sensitivity, colour perception, and visual integration were significantly lower in AD patients than in healthy controls. Compared to healthy controls, macular thinning in the central region was significant in the mild AD patients, while macular thickening in the central region was found in the moderate AD group. The analysis of macular layers revealed significant thinning of the retinal nerve fibre layer, the ganglion cell layer and the outer plexiform layer in AD patients relative to controls.

Shortcoming

There is **no uniform research standard** for OCT detection of Alzheimer's disease

If the patient has glaucoma and other **diseases that cause damage to the fundus**, the accuracy of the results will be affected

Observational Area: OCT angiography (OCTA) presents a **smaller observational area** compared to other imaging techniques like fundus fluorescein angiography (FFA) and indocyanine green angiography (ICGA)

Barriers & Flaws

Hard to
determine

Characteristics
mechanisms

transform

Signals for
biosensor to
detect

Few accessible data
Hard to evaluate

Detection not
convenient enough



Prospect

- Exploring determining factors / pathways
- Utilize advanced factors

Hard to
determine

Characteristics
mechanisms

transform

Signals for
biosensor to
detect

Few accessible data
Hard to evaluate

Detection not
convenient enough

Develop existing technology
Smaller, quicker,
cheaper, painless

Main Reference List

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