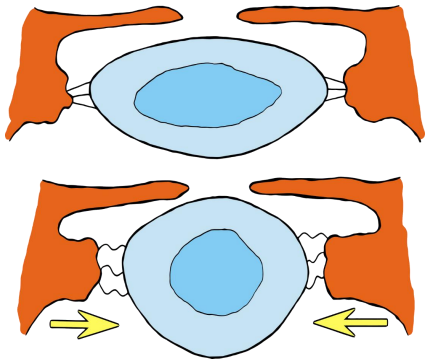
Assesment of accommodation

- Is the physiologic ability of the eye to change the refractive power of the crystalline lens which enables the eyes to focus at various distances
- It is measured in diopters, which is the reciprocal value of the fixation distance

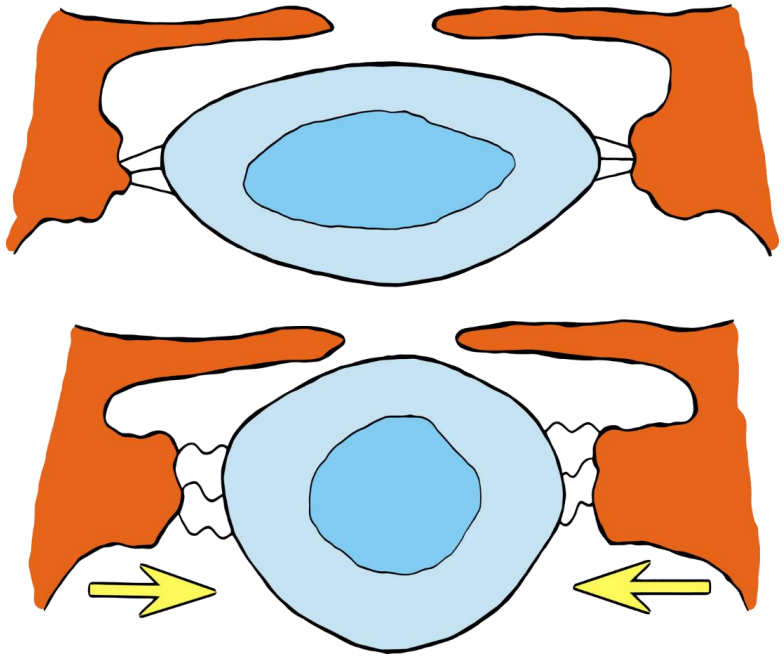
  (If the fixation distance is 0,5 m, the accommodation is 2 D)



Accommodation

Four structures are involved in accommodation:

- **the lens**
- **zonules**
- **ciliary muscle**
- **choroid**



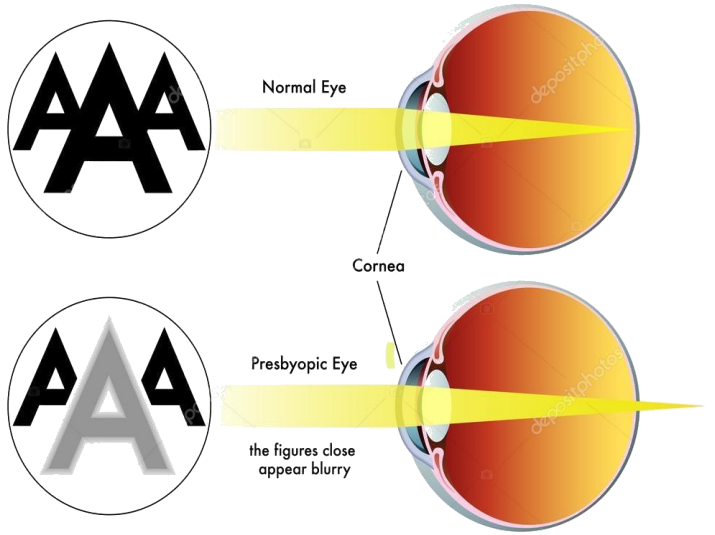
Principles and Theories of accommodation

- Helmholtz’s theory
- Schachar’s theory
- Coleman´s theory

- **Homework**

Presbyopia

- **Definition**
  - The term comes from the Greek *presbyteros*, which means „old-age vision“
  - **Is not an error of refraction**
  - Is normal age-related loss of the visual system – loss of ability to focus on things at near
  - The eye lens loses its elasticity with age and there is a physiological decrease in accomodation amplitude
  - The near point moves away from the eye
  - It begins between 40-45 years of age



Presbyopia

Prevalence

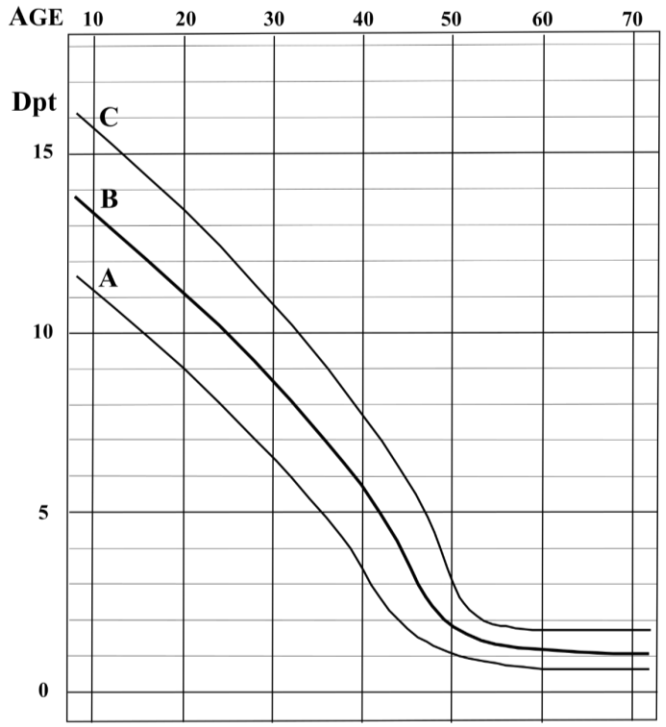
- increeaces with age
- it affects all of us once we reach our 40s, the onset of presbyopia is affected by refractive errors
- obviously, presbyopia would appear late in a myopia and early in a hyperopia

Risk factors

- age
- systemic illness
- effect of drugs

The main risk factors speeding up of manifestation presbyopia are the refractive errors and the age.

The change of amplitude of accommodation with age



Expected Values of Accommodation (Diopters)

Age (years)	Donders	Duane (mean)	Hofstetter (probable)
10	14	13.4	15.5
15	12	12.6	14
20	10	11.5	12.5
25	8.5	10.2	11
30	7.0	8.0	9.5
35	5.5	7.3	8
40	4.5	5.9	6.5
45	3.5	3.7	5
50	2.5	2.0	3.5
55	1.75	1.3	2
60	1.00	1.1	0.5
65	0.50	1.1	0.5
70	0.025	—	—

- Amplitude of accommodation decreases from the age of 5 and approximately 0,3 D per year

Presbyopia - symptoms

- They appear when the value of the accommodation amplitude does not correspond to the visual requirements
  - decreasing of accommodation
  - above the age of 40 – when accommodation decreases physiologically (individual)
  - more and more difficult to see near objects distinctly
  - the trouble is experienced at first in the evening when the light is dim and the pupils are dilated
  - blurred vision at near range for the required distance – patients complain about „short hands“
  - eye discomfort
  - headache may occur, the eyes feel tired
  - astenopia
  - **half shutting of the eyes**
  - fatigue after work
  - sooner or later appear symptoms of eye-strain
  - the need for quality lighting

Correction of presbyopia

- **Add** (add.) – near adition

  - the difference between far and near correction

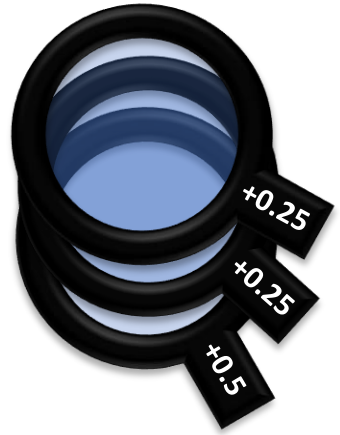
(long and short correction)

  - replaces physiologically decreasing of accommodation amplitude

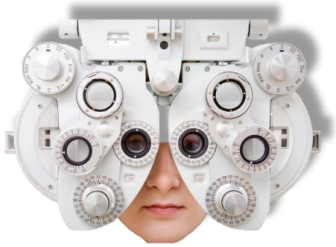
  - the strength of near add increases as the age increases

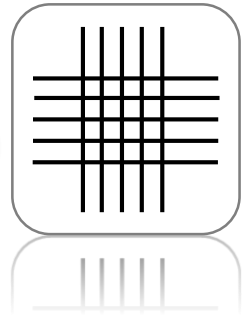
Presbyopic patients need two different prescriptions: one for far away and one for near (depends on patient´s refraction)

Correction of presbyopia



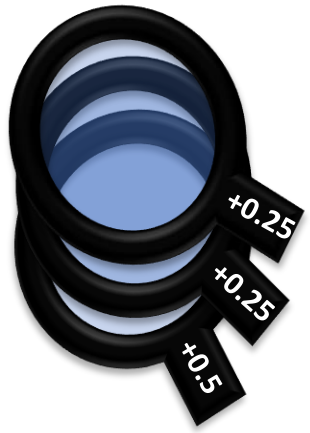
- **The standard clinical techniques for determining the appropriate near-vision addition:**
  - **Add based on patient´s age**
  - **Calculation**
  - **Grid test with cross-cylinder**
    - **Near duochrome (red-green test)**
    - **Sharpness interval**





Correction of presbyopia

- One of standard clinical techniques for determining the appropriate near-vision is: **add based on patient´s age**
  - **The difference between the distance correction and the strength needed for near vision is called the add**
- **The basic orientation parameters are AGE of patients and reading needs, the value is for guidance only – it is necessary to subjectively verify the value**



YOUR AGE	RECOMMENDED READING GLASSES POWER
40 - 44	+0.75 to +1.00 D
45 - 49	+1.00 to +1.50 D
50 - 54	+1.50 to +2.00 D
55 - 59	+2.00 to +2.25 D
60+	+2.25 to +2.50 D

Correction of presbyopia

- Single vision lenses – near – glasses (and distance glasses if the patient needs it)
- Bifocal, Trifokal, Progressive lenses - glasses
- Contact lenses – multifocal or monovision

<u>Next possibilities of correction of the presbyopia</u>

- Surgical correction (LASIK)
- Refractive lens exchange