

***The investigation of meridional accommodative disorders in children with with-the-rule astigmatism and there treatment.***

**I.M. Kuzhda, M.D., Ph.D.,  
V.I. Serdyuchenko, Prof.**

***Ivano- Frankivsk regional children's clinical hospital, Ivano-  
Frankivsk, Ukraine,  
Filatov Institute of Eye Diseases and Tissue Therapy, Odessa,  
Ukraine***

# *Background and methods*

- Astigmatism is one of the most frequent refractive abnormalities in children. Astigmatism offers 34,5-39% among all forms of refractive abnormalities.
- Adaptation of visual system to astigmatism is provided with two mechanisms – irregular accommodation in main meridians and regular fluctuations of optic setting, thank to which different focal lines connect with retina.
- The investigation of adaptation to astigmatism by irregular accommodation in different meridians of astigmatic eye is an actual problem in pediatric ophthalmology.

# ***Purpose***

- ▶▶ **To investigate accommodative disorders in different forms of with-the-rule astigmatism, to increase the effectiveness of treatment refractive amblyopia in children by use the modified original method of treatment accommodative disorders by its training in weak meridian**

# ***Material and methods***

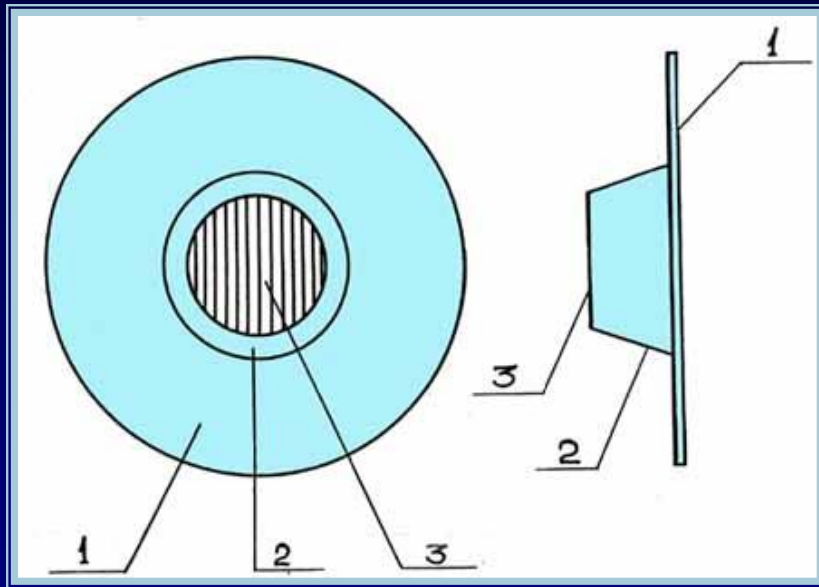
- ▶▶ **183 children (358 eyes) from 5 to 14 years old with different forms of with-the-rule astigmatism (mixed astigmatism, simple hyperopic astigmatism, simple myopic astigmatism) were investigated.**
- ▶▶ **The degree of astigmatism: 0,75 – 5,0 D**
- ▶▶ **Main meridians:**
  - **vertical: from 70 to 115 degrees;**
  - **horizontal: from 160 to 25 degrees**

# ***Material and methods***

- ▶▶ **visual acuity (VA) for far and for near, (corrected and non-corrected);**
- ▶▶ ***proxymetria in main meridians (the nearest point of clear vision (NPCV))***
- ▶▶ **ophthalmometria**
- ▶▶ **refractometria**
- ▶▶ **binocular vision functions**
- ▶▶ **common indexes of accommodation**

# ***Diaphragma of Vyasovskiy-Serdyuchenko***

## *Theoretical advantages of diaphragma:*



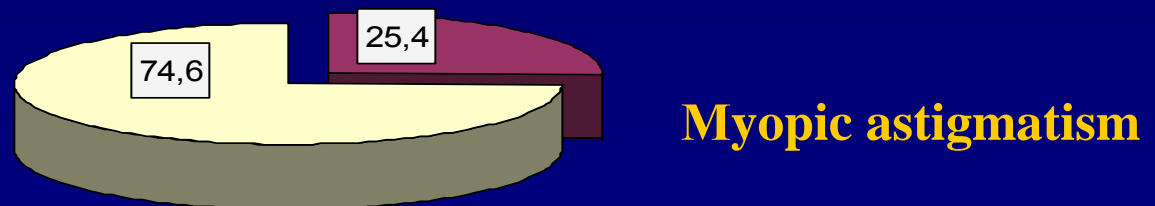
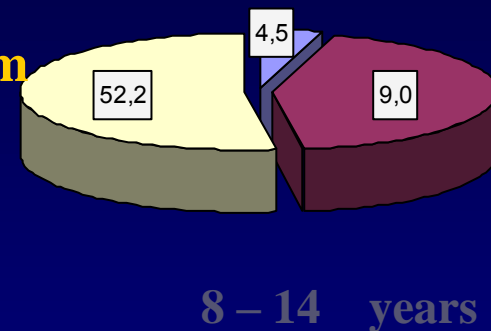
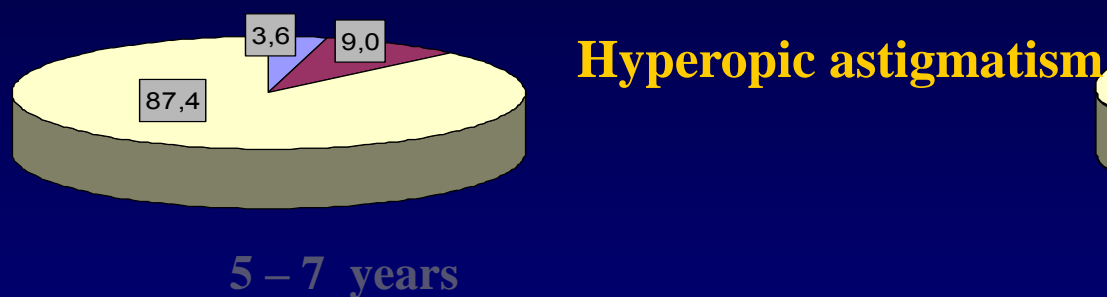
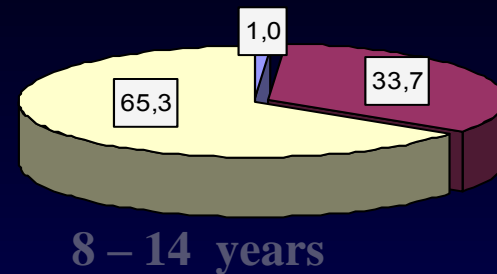
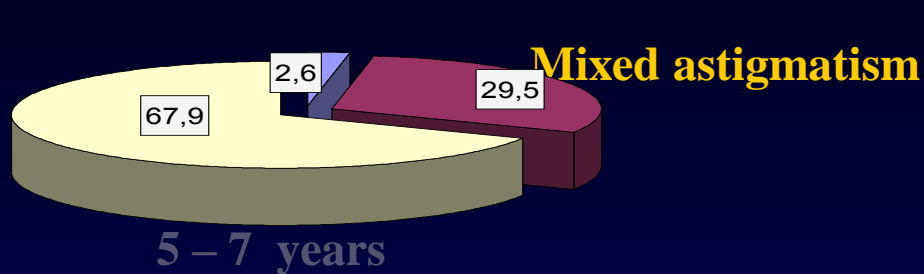
1 – the plane of diaphragma  
2 – the hollow  
3 – the grate

- ▶▶ **One can see the pupil of the eye and centralize it**
- ▶▶ **Diaphragma hold its function even be moved**
- ▶▶ **The lighting of retina is more by 5 times, then while using Sheiner's diaphragma**
- ▶▶ **Visual fields are wider to 80-90 degrees**

# *Different forms of meridional accommodation*

- **1. Regular accommodation - the quantity of difference of NPCV in diopters in main meridians ( $\Delta NPCV$ ) is equal to the degree of astigmatism:  $\Delta NPCV = \Delta R$ .**
- **2. Irregular accommodation**
  - 2a) the quantity of difference of NPCV in diopters in main meridians ( $\Delta NPCV$ ) is lesser, then degree of astigmatism:  $\Delta NPCV < \Delta R$ . This condition can tell about the partly «adaptation» to astigmatism.
  - 2b) the quantity of difference of NPCV in diopters in main meridians ( $\Delta NPCV$ ) is more, then degree of astigmatism:  $\Delta NPCV > \Delta R$ . This condition can tell about the «desadaptation» to astigmatism.
  - 2c) the quantity of NPCV in diopters is equal in main meridians ( $\Delta NPCV = 0$ ). This condition can tell about the full «adaptation» to astigmatism.

# Different forms of meridional accommodation



- $\Delta NPCV = \Delta R$ ; regular accommodation
- $\Delta NPCV < \Delta R$ ; partly «adaptation» to astigmatism
- $\Delta NPCV > \Delta R$ ; «desadaptation» to astigmatism



# Methodic of training accomodative ability

***So, we proposed the original methodic of training accomodative ability in weak meridian by using changing of positive and negative cylindrical lenses in order to increase non-corrected and corrected visual acuity for far and for near in children with astigmatism. Cylindrical lenses were put before the eye in the meridian that had shown the maximum distance of NPCV. We proposed the special ruler also for more comfort of treatment.***

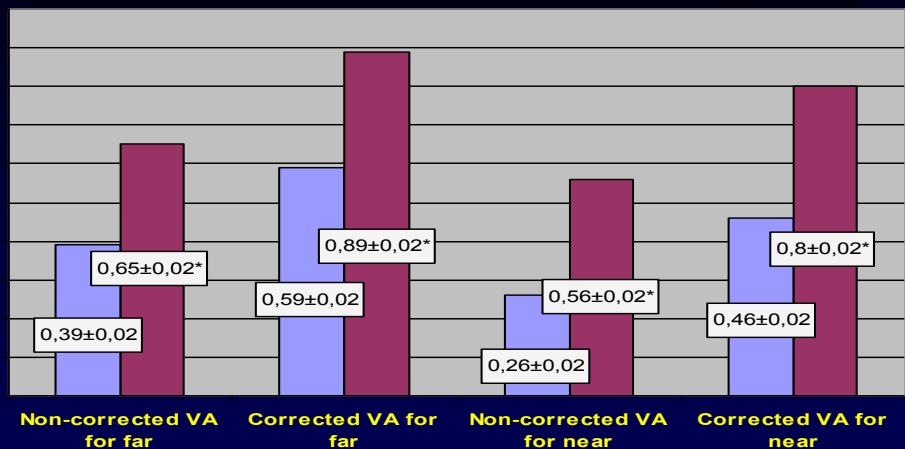
***Special rulers for more comfort of  
treatment (Ukrainian Official Scientific  
Patents №28124, № 4732).***



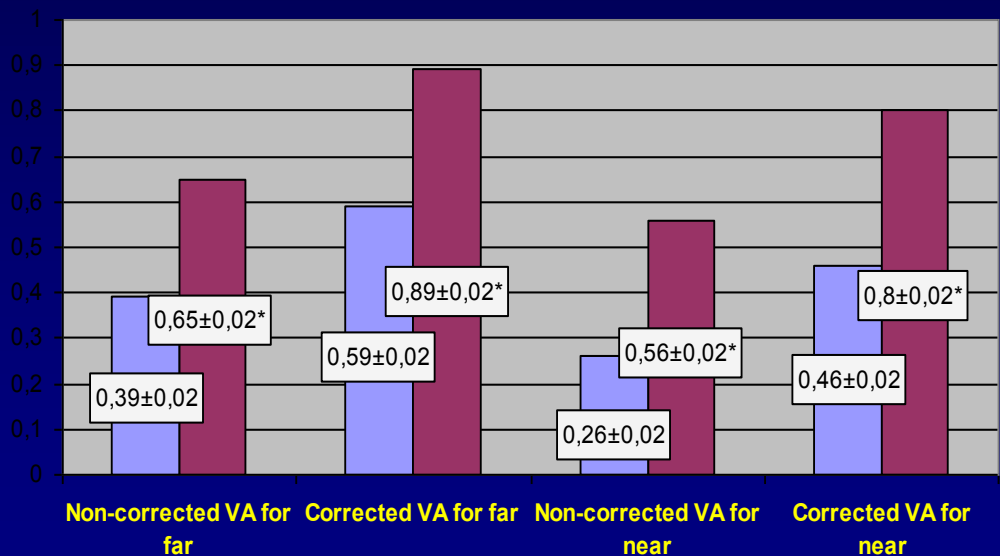
# Results of treatment of children with mixed astigmatism

5-7 years

Results of treatment of children with mixed astigmatism



8-14 years

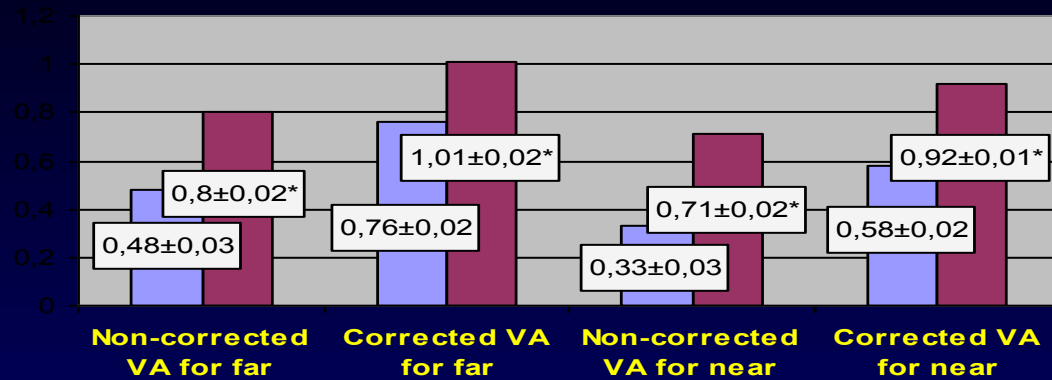


Before treatment

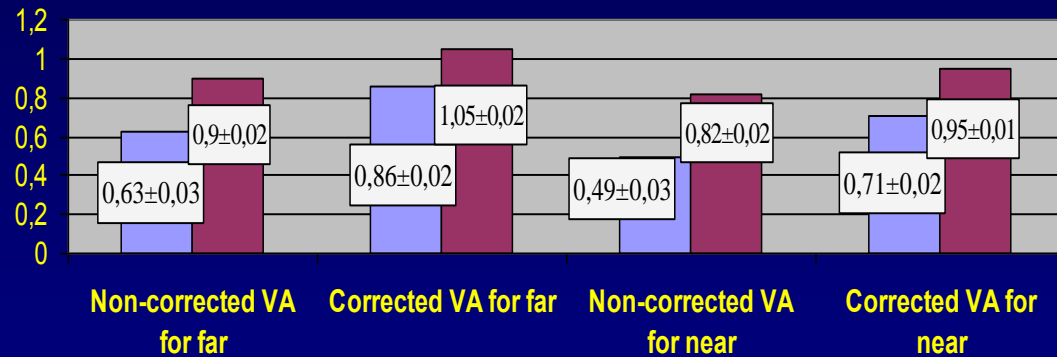
After treatment

# Results of treatment of children with simple hyperopic astigmatism

5-7 years



8-14 years

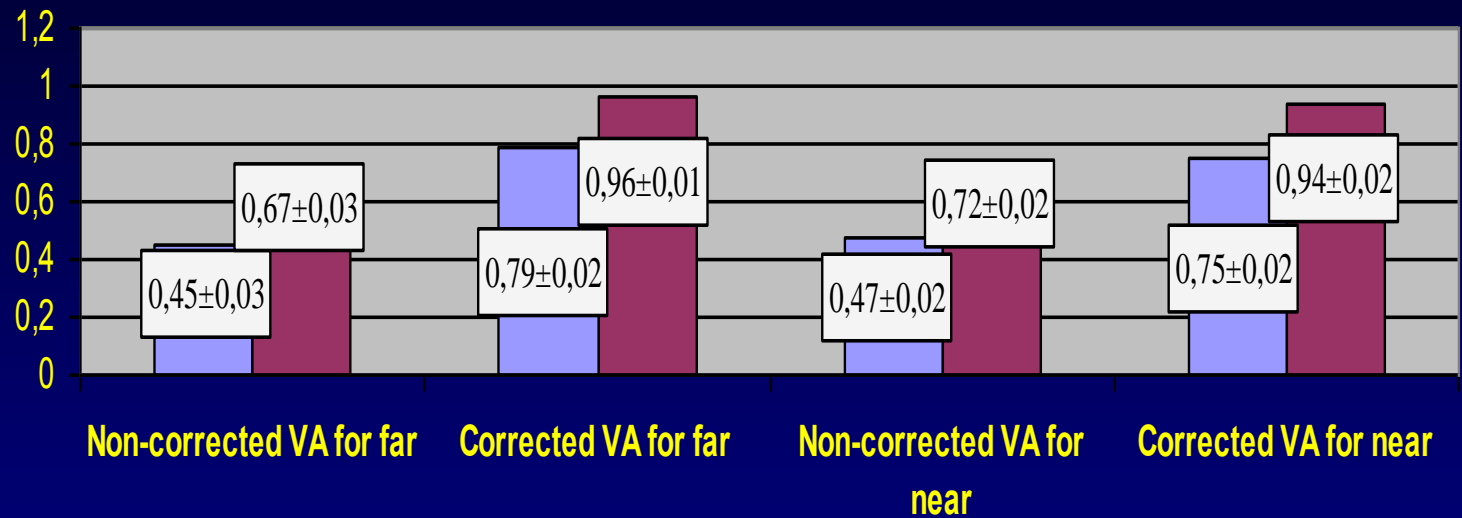


Before treatment



After treatment

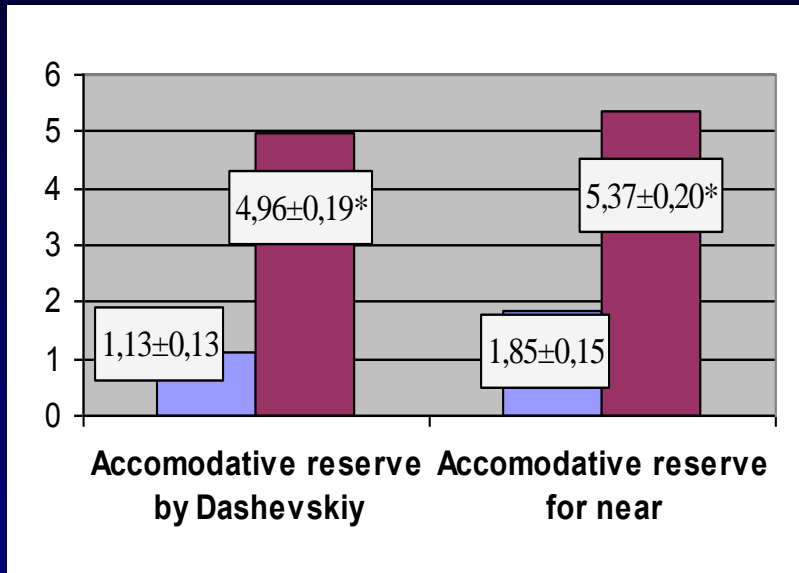
# Results of treatment of children with simple myopic astigmatism



 **Before treatment**

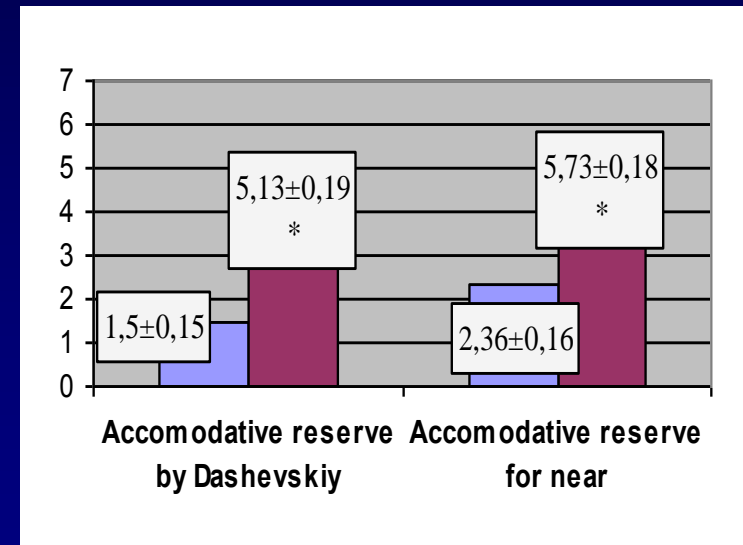
 **After treatment**

# Common accommodative indexes before and after treatment in children with mixed astigmatism



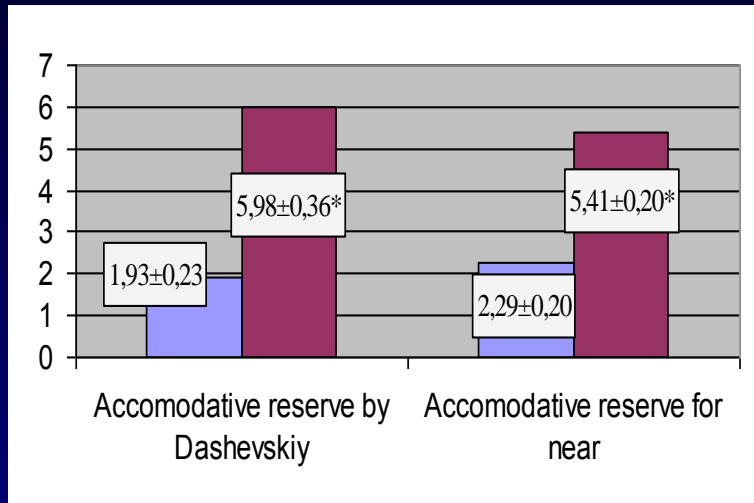
**5-7 years**

- Before treatment
- After treatment

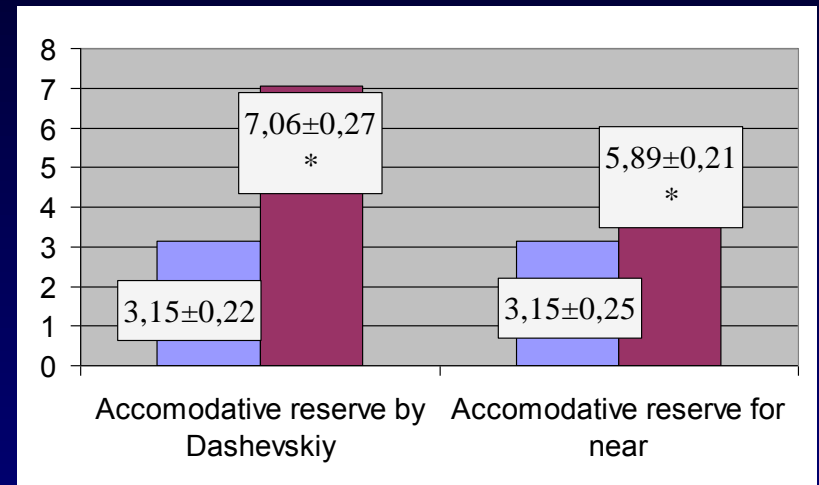


**8-14 years**

# Common accommodative indexes before and after treatment in children with hyperopic astigmatism



5-7 years

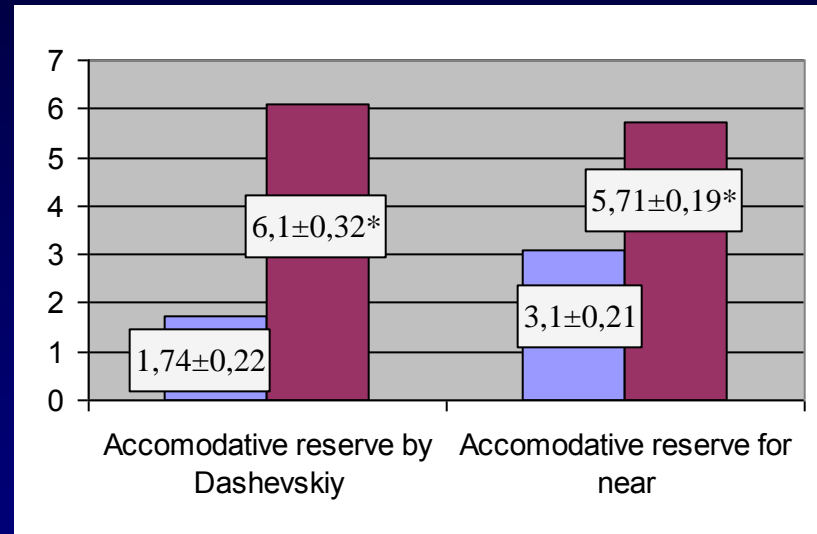


8-14 years

Before treatment

After treatment

# Common accommodative indexes before and after treatment in children with myopic astigmatism



 Before treatment

 After treatment



# ***Conclusion***

**The presence of irregular accommodation in the majority cases of investigated forms of astigmatism in children was shown. Different forms of meridional accommodation were determined. The influence of meridional accommodation upon visual acuity was shown. The use of proposed method of accommodative training in weak meridian is effective to treat refractive amblyopia in all forms of with-the-rule astigmatism.**

The authors of this investigation did not have any financial interest in it and did not have any conflict of interests.



**Thank You  
for attention!**

Contact e-mail:

1. [kuzhdamd@gmail.com](mailto:kuzhdamd@gmail.com)
2. [virais@ukr.net](mailto:virais@ukr.net)