

# The influence of accommodative spasm on the reliability and outcomes of optometric assessment.

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## INTRODUCTION

A spasm of accommodation is a phenomenon that can have a significant impact on the results of an optometric examination, leading to an incorrect assessment of the refractive error. It occurs due to prolonged visual work at close distances, which results in excessive stimulation of the ciliary muscle and its contraction. As a result of this process, the refractive error shifts towards myopia, which can lead to false results in the visual acuity test. Such a phenomenon makes it difficult to assess the actual visual defect and can negatively affect the condition of the patient's visual system. The paper reviews potential causes and mechanisms that lead to spasm of accommodation, factors contributing to its development, and their potential impact on the diagnostic process. Analysis of the literature that was studied indicates various factors leading to this condition: neurological, psychological, and environmental. It needs to be taken into consideration that it's hard to assess a patient's refractive state separately from other variables.

## METHODS

To ensure that the outcome of an optometric refraction measurement is the most reliable, in our research we gathered people of similar age, without binocular vision anomalies, illnesses influencing the accommodative system, and those, that with the best correction reached full visual acuity. Prolonged visual load in direct stimulation of the ciliary muscle was assessed immediately after its end and compared to the ciliary muscle tone before excessive work.

## RESULTS

In more than half of the patients in the sample group, there was an observed shift in the refractive error toward myopia. The difference in these parameters indicates short-term ciliary muscle spasm and shows how muscle contraction affects the results of an optometric examination.

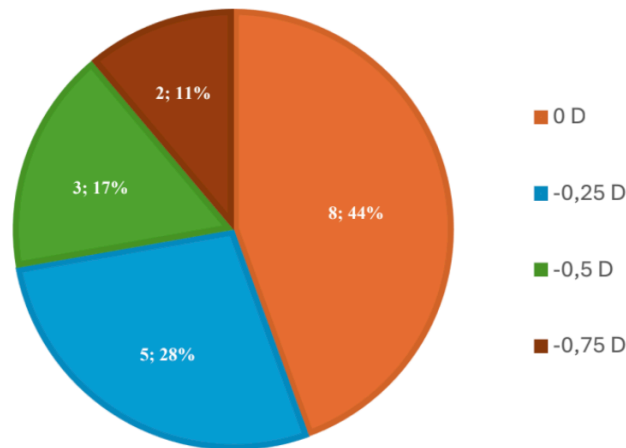


Figure. 1. Distribution of changes in the spherical component of refractive error before and after intensive near work.

ONE EYE (OS)			
Px	First measurement [D]	Second measurement [D]	Difference [D]
1	0,50	0,50	0
2	0,50	0,25	-0,25
3	0,50	0,00	-0,5
4	0,25	-0,50	-0,75
5	1,00	0,50	-0,5
6	0,50	-0,25	-0,75
7	1,00	0,50	-0,5
8	0,00	0,00	0
9	-3,75	-4,00	0
10	-4,25	-4,25	0
11	-2,25	-2,25	0
12	-1,25	-1,25	0
13	-2,5	-2,75	-0,25
14	1,00	1,00	0
15	1,00	0,75	-0,25
16	1,25	1,25	0
17	3,00	2,75	-0,25
18	1,75	1,50	-0,25

Table 1. Spherical values of refractive error measured using the open- field autorefractometer before and after intensive near work, along with the corresponding differences.

## CONCLUSIONS

Our study emphasizes the importance of appropriate relaxation of accommodation before starting an optometric examination. In particular, it draws attention to the importance of the type of visual activity of patients before the examination, the need for education on the impact of long-term visual work at near distances, and the introduction of appropriate procedures to minimize its impact on the examination result. The process of the accommodation and its effect on visual acuity is still not widely

known among the patients, so there needs to be a focus on educating patients on how their accommodative system works and how they can prepare for the examination to ensure the most reliable outcome.

## REFERENCES

- [1] S. Karmakar, P. Manna i P. Sarbajna, „Treatment Approches of Accommodative Spasm: A Mini-Review,” *Journal of Clinical and Experimental*, 2023.
- [2] E. S. Duignan, E. F. Hughes, B. P. Mullaney i M. P. Treacy, „Persistent pseudomyopia following a whiplash injury in a previously,” *American Journal of Ophthalmology Case Reports*, 2017.
- [3] P. Arriola-Villalobos, M. García-Montero, G. Felipe-Márquez i N. Garzón, „Pseudomyopia: A Review,” *Vision*, 2022.
- [4] Y. Sekiya, H. Shirabe i M. Yamamoto, „A review of excessive accommodation spasm cases,” *Department of Ophthalmology, School of Medicine,, Kobe University*, 1996.
- [5] A. Kavthekar,, M. Nishanth, M. Nivean, i N. Shruti, „Accommodative spasm : case series,” *TNOA J Ophthalmic Sci Res*, 2017.
- [6] W. Marsh-Tootle i R. P. Rutstein, „Acquired Unilateral Visual Loss Attributed to an Accommodative Spasm,” *Optom Vis Sci, School of Optometry, University of Alabama at Birmingham, Birmingham, Alabama*, 2001.
- [7] J. Kiermasz i J. Pniewski, „Dokładność i powtarzalność obiektywnego pomiaru wady refrakcji kowencjonalnym autorefraktometrem, autorefraktometrem otwartego pola oraz aberrometrem u młodych dorosłych,” *Optyka*, 2010.
- [8] L. N. Davies, B. Gilmartin, E. A. H. Mallen i J. S. Wolffsohn, „Clinical Evaluation of the Shin-Nippon NVision-K 5001/Grand Seiko WR-5100K Autorefractor,” 2003.
- [9] M. Scheiman i B. Wick, „Clinical Management of Binocular Vision,” 2013.
- [10] E. F. Fincham, „The accommodation reflex and its stimulus,” 1951, pp. 381-392.