Should Optics Be Taught as Continuing Medical Education to Optometrists?

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Abstract: Optics concepts are fundamental to optometry. Currently, there is no published data on the status of conceptual optics among Indian optometrists. The results indicate the need for optics continuing education throughout their career. © 2021 The Author(s)

Optometry is a four-year professional program [1,2], where optics especially geometric optics and its applications to the eye is of paramount important [2-4]. In addition, optics concepts and ideas are applied to various other subjects such as refraction, optical dispensing, and prescription of low vision devices. Hence knowledge of optics is necessary thought the career of the optometrist. Till 1984 in India, the typical optometry program was only two years. The first modern four-year optometry program was started in only 1985 in Chennai [5]. Recently (2021) the optometry profession was recognized by the Government of India (GoI) and a national level council for optometry is being established [1]. However, the model optometry curriculum was published in 2015-2016 by GoI [6]. In India, the four-year optometry program students learn conceptual optics in their undergraduate program mainly in the first and second year of their studies [6]. To the best of our knowledge, there is no published data on the current status of conceptual optics knowledge among Indian optometrists.

We surveyed Indian optometrists and optometry students using the Light and Optics Conceptual Evaluation (LOCE) questionnaire that was originally developed for UNESCO's ALOP program (active learning in optics and photonics) [2,7]. This instrument has fifty (50) multiple-choice question covering both geometric and physical optics, Topics covered include: 4 questions on reflection and mirrors, 5 on Snell's law, 7 on ophthalmic lenses, 15 on imaging, 2 on visual optics, 8 on polarization and scattering, and 8 on wave optics, interference, and diffraction. The questionnaire was administered using the online Google forms between September 1, 2020, and April 30, 2021. The questionnaire survey was taken by optometrists with various levels of experience as well as currently enrolled optometry students. Every correct response was given one point (1). The incorrect response was given zero or no point and there no negative scoring was used.

A total of 125 (78.40 % Female) 32 practicing optometrists and 93 optometry students participated in this study. Table 1 shows the overall mean ± SD age of the study sample was 20.65 ± 2.27 years (Male: 20.56 ± 2.17, Female: 20.67 ± 2.31). The mean ± SD age of optometrists was 23.28 ± 2.70 years and optometry student age were 19.74 ± 1.11. The mean age between optometrists and optometry student were found to be a statistically significant difference (p=0.000). Out of 32 optometrists, 30 participants (93.75 %) were doing their masters degree program in optometry. The other 2 were practicing optometrists attached to an eye hospital. Their overall mean ± SD of work experience was 2.28 ± 2.70 years.

Table 1. Sample size, age, and outcome score data of study subjects

	Sample size (n)	Mean ± SD Age (years)	Mean ± SD score	Min-Max score
1st Years	16	18.38 ± 0.62	13.06 ± 4.42	4.0 – 18.0
2nd Years	56	19.73 ± 0.92	15.50 ± 5.06	0.0 – 30.0
3rd Years	18	20.78 ± 0.65	12.78 ± 6.85	0.0 – 23.0
Final Years	3	21.00 ± 0.00	08.00 ± 7.94	2.0 – 17.0
Student's Overall	**93**	**19.74 ± 1.11**	**14.31 ± 5.61**	**0.0 – 30.0**
Optometrist	32	23.28 ± 2.70	23.03 ± 8.57	6.0 - 41.0
Overall	**125**	**20.65 ± 2.27**	**16.54 ± 7.50**	**0.0 – 41.0**
p-value		0.000*	0.000**	NA

*Mann-Whitney U Test, ***Student t-Test*

The overall mean ± SD score was 16.54 ± 7.50. The optometry student mean ± SD score was 14.31 ± 5.61 (Range 0.0 – 30.0) and the same was with optometrists 23.03 ± 8.57 (Range 6.0 – 41.0), which was found to be statistically significant between the groups (p=0.000). Figure 1 shows a weak and positive correlation between age and overall score (r^2=0.186, p=<0.000). Though our study population consists of higher number of female participants (78.40%) the overall score didn't differ between gender (p=0.618).
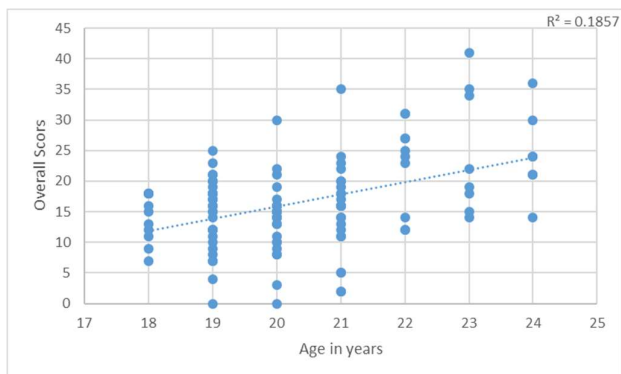

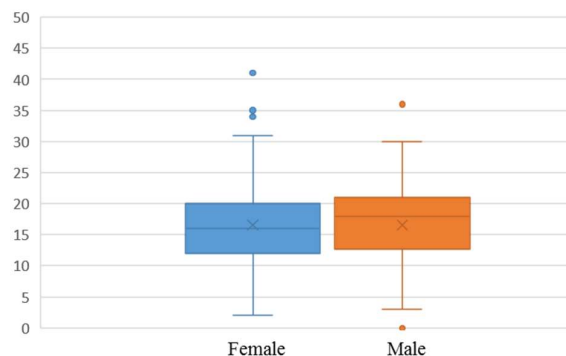Fig 1: correlation was seen between age and overall score.

Fig 2: A boxplot – Gender difference in overall score.

The mean score difference between optometrists and optometry students was 8.72. Likewise, the mean score difference between 1st and 2nd years of optometry students and 3rd and final year optometry students was 2.98. The lowest score was observed in final-year optometry students. The better scores results were observed among optometrists in the Master's program. This could possibly due to the fact that the vast majority (93.74 %) were currently enrolled. The usual admission to the post-graduate program is based on entrance examination performance. Hence the optometrists would have been forced to re-learn the optics subject as part of their entrance exam preparation. The other possibility of better scores by the optometrists are in general people who joins higher studies like master's program would have good academic performance with a high grade point average. The current study used the online objective assessment method which has been reported to have various limitations including it encouragement of guessing [8]. Another potential bias in the study could be the inconsistent sample size between-groups.

The outcome of this study underscores the need to have continuing education in optics throughout the professional lifetime of the optometrist practitioner as well as students throughout their education program and not just in the first and second year as is currently done.

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