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Comparing accommodative function between dominant and non-dominant eye

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ABSTRACT

Aim: This study aims to compare accommodative functions between the dominant and non dominant eyes.
Materials and Methods: A comparative study done in 50 healthy subjects include both males and females with age group ranging between (18 -25 years). It was a hospital-based study conducted in the outpatient department of Ophthalmology. The comparison of accommodative function between dominant and non-dominant eyes is measured to determine which eye shows a higher level of accommodative function. This study has been approved by IRB committee, before beginning this study informed consent has been given and the procedure has been explained clearly, 50 Young emmetropic adults were included. All participants were subjected to comprehensive ophthalmic examination including vision, refraction, Intraocular pressure measurements, slit-lamp examination, the dominance of eye is determined using the hole in the card method and Accommodative functions like the Monocular estimated method (MEM), Near the point of accommodation (NPA) and Accommodative facility (AF) done to find out the ocular dominance.
Result: This study shows a higher level of accommodative function in all aspects of accommodative factor such as Monocular estimated method (MEM), near the point of accommodation (NPA) and accommodative facility in the dominant eye. The Mean and Standard deviation value shows a significant difference in all parameters in the dominant eye with a t-value of 7.055(p=.000) when comparing with the Non dominant eye.
Conclusion: Comparing the accommodative function between the Dominant and Non dominant eye we concluded that the Near Point of accommodation and accommodation facility were observed more in the dominant eye as compared with the non dominant eyes. The mean accommodative lead was found to be greater than the normal individual (dominant eye). Hence, it is concluded that the dominant eye has a better accommodative function than the non dominant eye.

1. Introduction

Ocular dominance, sometimes called eye preference is the tendency to prefer visual input from one eye to the other. Dominance can change and may switch between the eyes depending on the task and physical condition of the subjects. Accommodation is assimilation of the eye in order to obtain clear vision of objects at various distances. Accommodation is achieved by a change in the refractive power of the optical system, which leads to the focusing of the image on the retina.[1] The amplitude of accommodation is the higher potential increase in optical power that an eye can achieve in adjusting its focus.[2] The lag of accommodation is the amount by which the dioptric accommodative response is less than the accommodative stimulus. Insufficiency of accommodative is an anomaly that is characterized by an inability to focus or sustain focus at near.[3] This comparison of accommodative function in dominant and non-dominant

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eye which help us to get a more accurate preview of the shot and better alignment. The measurement of amplitude of accommodation and accommodative anomalies also plays a major role in optometry filed[4] i.e., to evaluate refractive error of the patients by using Retinoscopy.

2. Materials and Methods

This study has been approved by Institutional Review Board of Saveetha College of Allied Health Sciences (SCAHS/IRB/2021/MAY/144), before beginning of this study informed consent has been given and the procedure explained clearly to the participants with the age group of 18-25. All participants were subjected to comprehensive ophthalmic examination including standard clinical examination.

2.1. Hole in the card chart

Ocular dominance was determined by using the hole in the card test. The distance hole-in-the-card test was performed first. The subject was given a piece of black paper with a three cm diameter circular hole in the centre of the card. The subject was instructed to hold the paper with both hands straight ahead at arm's length while viewing a single 20/50 letter at 10 feet with both eyes. The examiner covered the left eye and asked the subject if they could still see the letter. The examiner then covered the right eye and asked again if the subject could still see the letter. The eye that could see the letter was recorded as the dominant eye (right or left). If the subject was able to see the letter with both the right and the left eye, Dominant eye was the eye that could maintain the fixed letter centred in the hole or close, being the contralateral eye occluded. The Accommodation of an eye was determined using several parameters which includes Monocular Estimation Method (MEM), Near Point of Accommodation(NPA) and Accommodative Flippers (AF).

The methods and procedure for these above parameters are explained below,

2.2. Monocular estimation method (MEM)

The monocular estimate method (MEM) was used to measure the accommodative lag. Retinoscopy was carried out with the subject's corrected ametropia most plus (CAMP) lens placed in the trial frame under normal room illumination. A special near point card named MEM CARD having a central hole attached to the head of the retinoscope was used. The accommodative target was a paragraph with approximately 20/30-sized text, and the testing distance was 40 cm. A string attached to the retinoscope handle at one side and the trial frame on the other side was used in order to maintain a constant distance during the measurement. The examiner evaluated the retinoscopic reflex. A trial lens estimated to neutralize the motion was briefly and monocularly placed in front of one eye. Lens changes were continued in 0.25 D steps until the lowest powered lens that neutralized the reflex was determined. If there was not a specific lens that created neutrality, in other words, if reflex showed with motion with one lens and against with next lens, the mean power was recorded. If the required lens for neutrality was positive, it was representative of a lag of accommodation, and a negative lens was representative of a lead of accommodation. The measurement was repeated three times and the average recorded in dioptres. Normal value: +0.50 D. LAG=>+0.50, LEAD=-0.25.

2.3. Near point of accommodation

The amplitude of accommodation was determined using the push-up method. With the best correction in the trial frame and in normal room illumination, the subject's attention was directed to the one line before the best corrected visual acuity on a reduced Snellen chart that was positioned at 40 cm and moved slowly towards him/her.

The subject was instructed to keep the accommodative target as clear as possible and to report when it blurred as the target was brought closer. The endpoint of measurement was the first sustained blur which was when the subject could no longer clear the target within 2 or 3 s of viewing. The distance of this point to the spectacle plane was measured with a millimeter ruler three times, and the average was recorded and converted to dioptres. The above steps were repeated with each eye separately (monocularly) and binocularly. Normal values 10yrs= 14D, 20 Yrs= 10D, 30 yrs=7.5D.

2.4. Accommodative flippers

Accommodative facility was tested using flipper lens. The selected power for the flipper was ±2.00 D. The subjects were asked to observe the fixation target, and the flipper lens was changed from the plus to the minus and back again to the plus; this constitutes one cycle. The target should be clear with each lens flip. The number of cycles that the subject was able to complete in 1 minute was measured three times, and the average was recorded as the accommodative facility in cycles per minute. Normal values for adults Uniocular- 11cpm, Binocular- 15cpm.

3. Results

It is observed that 50% of the subjects who participated in this study are males and another 50% of them are females and the same is depicted in Figure 1.

3.1. Comparison of dominant and non-dominant eyes with respect to near point of accommodation (NPA)

This section presents the comparison of dominant and non-dominant eyes with respect to the near point of

Table 1: Descriptive statistics for age

	N	Minimum	Maximum	Mean	Std. Deviation
Age	50	18	30	22.78	3.183

Source: Primary data

Table 2: Comparison of dominant and non-dominant eyes with respect to NPA

		Mean	S.D	t value
NPA (D)	Dominant	14.43 diopter	2.130	7.112** (p = .000)
	Non-Dominant	11.79 diopter	1.532	

Source: Computed from Primary data

Table 3: Comparison of dominant and non-dominant eyes with respect to accommodative facility

		Mean	S.D	t value
AF (CPM)	Dominant	15.06cmp	2.673	5.327** (p = .000)
	Non-Dominant	12.36cpm	2.386	

Source: Computed from Primary data

Table 4: Comparison of subject's MEM with normal value of MEM

	Mean	Std. Deviation	t value
MEM	-1.05 diapter	0.556	7.055** (p = .000)

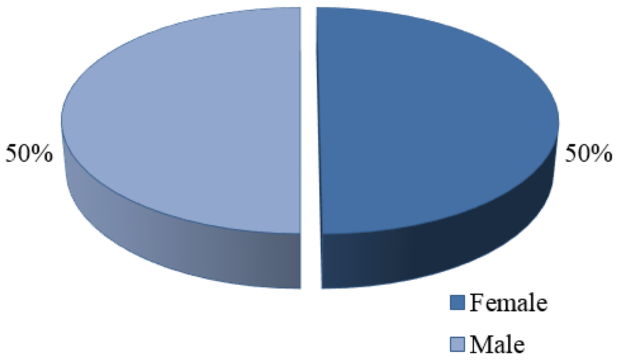

Fig. 1: Distribution of gender

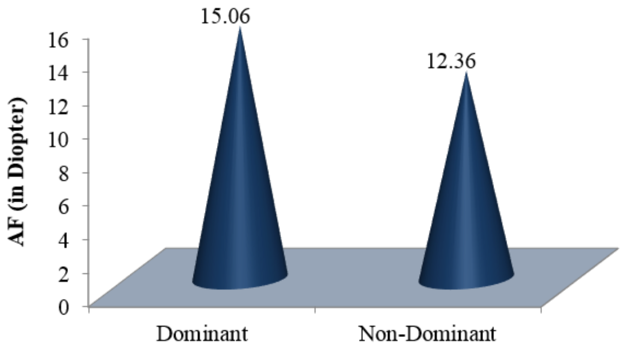

Fig. 3: Dominant and non-dominant eyes with respect to AF

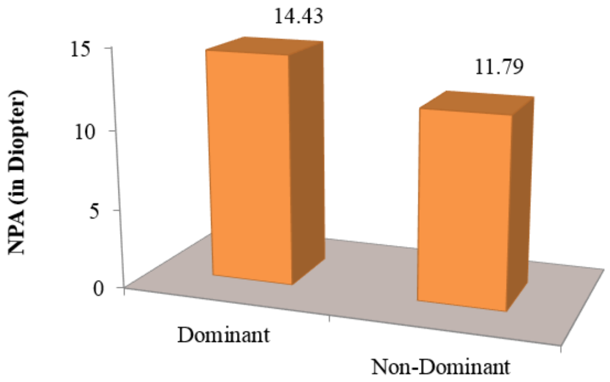

Fig. 2: Dominant and non-dominant eyes with respect to NPA

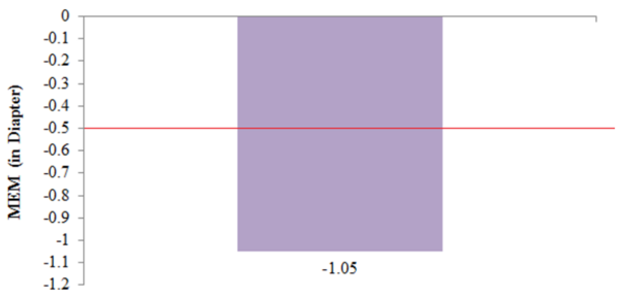

Fig. 4: Dominant and non-dominant eyes with respect to AF

accommodation. For this purpose, independent samples t-test is applied. The results are shown in Table 2.

From the Table 2, the t-value of 7.112 (p=.000) reveals that there is a significant difference observed between dominant and non-dominant eyes with respect to the near point of accommodation. Further, the mean near point of accommodation (14.43 diopter) is significantly greater than the mean near point of accommodation (11.79 diopter). This shows that the near point of accommodation is observed more in dominant eyes as compared with the Non-dominant eyes. The comparison is shown graphically in Figure 2.

3.2. Comparison of dominant and non-dominant eyes with respect to accommodative facility (AF)

This section presents the comparison of dominant and non-dominant eyes with respect to accommodative facility. For this purpose, Independent samples t-test is applied. The results are shown in Table 3.

From Table 3, the t-value of 5.327 (p=.000) reveals there is a significant difference observed between dominant and non-dominant eyes with respect to the near point of accommodation. Further, the mean near point of accommodation (15.06cmp) is significantly greater than the mean near point of accommodation (12.36cpm). This shows that accommodative facility is observed more in dominant eyes as compared with the Non-dominant eyes. The comparison is shown graphically in Figure 3.

3.3. Comparison of dominant and non-dominant eyes with respect to monocular estimation method (MEM)

This section presents the comparison of subjects' monocular estimation method with the normal value of monocular estimation Method (-0.5). For this purpose, the one-sample t-test is applied. The results are shown in Table 4.

From Table 4, the t-value of 7.055 (p=.000) reveals that monocular Estimation Method (-1.05 diopter) readings are significantly greater than the normal value of MEM (-0.5). The comparison is shown graphically in Figure 4.

4. Discussion

Dominance can change and should switch between the eyes counting on the task and fitness of the themes. Accommodation is that the adaption of the eye to get a transparent vision of objects at various distances and results in the focusing of images on the retina·The objective of the study is to derive the mean and variance and its amplitude of accommodation (NPA), Accommodation facility, and accommodative lag within the dominant and non-dominant eye.[5]

The Amplitude of accommodation is that the maximum potential increase in optical power that an eye fixed are able to do in adjusting its focus, the quantity by which the dioptre accommodative response is a smaller amount than the accommodation stimulus is that the lag of accommodation.[6,7]

A lead of accommodation exists when the accommodative stimuli. As per previous study D Lopes-Ferreria, et al.,[8] explored the relationship between ocular dominance and visual acuity, they verified that when the right eye was the dominant eye, its visual acuity was slightly better than the left non-dominant eye.[4,9] Study done by Jimenez, et al found that accommodative facility is a parameter that both in the statistical results and optometric judgment itself, presents different values for varying ages.[10]

B Sterner,[10] observed that emmetropes of age between 18-27years. measured the accommodative lag in young adults using dynamic retinoscopy also show that amount lag is about 0.50 to 1.00 D.[11] The key finding within the present study is that the amplitude of accommodation and accommodative facility was superior within the dominant eye compared with the non-dominant eye during a group of young emmetropic adults. These differences were statistically significant and accommodative lead was found to be higher within the dominant eye.[12]

5. Conclusion

Comparing the accommodative function between the dominant and non dominant eye we concluded that the near point of accommodation and accommodation facility were observed more in the dominant eye as compared with the non dominant eyes. The mean accommodative lead was found to be greater than the normal individual (Dominant eye). Hence, it is concluded that the dominant eye has a better accommodative function than the non dominant eye.

6. Source of Funding

None.

7. Conflict of Interest

The author have declared that no conflict of interests for this study.

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References

1. Banks MS. The development of visual accommodation during early infancy. *Child Dev*. 1980;51(3):646–66.
2. Ovenseri GO, Ogbomo, Oduntan OA. Mechanism of accommodation: A review of theoretical propositions. *African Vision and Eye Health*. 2015;74(1). doi:10.4102/aveh.v74i1.28.

3. Allen PM, O'Leary DJ. Accommodation functions: co-dependency and relationship to refractive error. *Vision Res*. 2006;46(4):491–505.
4. Jiménez R, González MD, Apérez MA, García JA. Evolution of accommodative function and development of ocular movements in children. *Ophthalmic Physiol Opt*. 203;23(2):97–107.
5. Linke SJ, Baviera J, Munzer G, Steinberg J, Richard G, Katz T. Association between ocular dominance and spherical/astigmatic anisometropia, age, and sex: analysis of 10,264 myopic individuals. *Invest Ophthalmol Vis Sci*. 2011;52(12):9166–73.
6. Hamed MM, James K, Farshad A, Momeni MH, Kundart J, Askarizadeh F. Comparing measurement techniques of accommodative amplitudes. *Indian J Ophthalmol*. 2014;62(6):683–7.
7. Eser I, Durrie DS, Schwendeman F, Stahl JE. Schwendeman F, Stahl J E. Association between ocular dominance and refraction. *J Refract Surg*. 2008;24(7):685–9.
8. Ferreria DL, Neves H, Queiros A, Ribeiro MF, de Matos SCP, González JM. Ocular dominance and visual function testing. *Biomed Res Int*. 2013;2013:238943.
9. Lopes-Ferreira D, Neves H, Queiros A, Faria-Ribeiro M, de Matos SCP. Ocular dominance and visual function testing. *Biomed Res Int*. 2013;2013:238943. doi:10.1155/2013/238943.
10. Strener B, Abrahamsson M, Sjostrom A. Accommodative facility training with a long term follow up in a sample of school aged children showing accommodative dysfunction. *Doc Ophthalmol*. 1999;99(1):93–101.
11. Ovenseri-Ogbomo GO, Kunjawu EP, Kio FE, Abu EK. Investigation of amplitude of accommodation among Ghanaian school children. *Clin Exp Optom*. 2012;95(2):187–91.
12. Porac C, Coren S. The dominant eye. *Psychol Bull*. 1976;83(5):880–97.

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