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Accommodation Function in Malaysian Chinese Primary School Children

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ABSTRACT:

Measurement of accommodation functions are crucial component while diagnosing non strabismic binocular vision anomalies. The effect of race has been reported to influence the accommodation norms especially during school age. Therefore, the aim of this study to provide a baseline data of accommodation functions for Malaysian Chinese primary schoolchildren. A cross sectional study was conducted with total subject of 50 Malaysian Chinese primary school children age 8-12 years old (9.6±1.2 years). Amplitude of accommodation (AA) was measured by Donder's push-up method, response of accommodation and facility of accommodation (FA) was measured by Monocular Estimation Method (MEM) and ±2.00DS flipper lens respectively, and relative accommodation was measured using minus and plus lenses. The mean of monocular and binocular AA was 11.23±1.76 D and 11.36±2.27 D respectively. The mean and standard deviation was 0.93±0.18D for response of accommodation, 10.48±2.57 cycle per minute (cpm) and 8.84±2.28 cpm for monocular and binocular FA respectively, -2.44±0.96D for positive relative accommodation (PRA), and +2.42±0.51D for negative relative accommodation (NRA). Analysis of Variance showed that no significant variation of accommodation functions across age groups except for monocular AA ($p=0.024$) and binocular AA ($p=0.028$). However, this study found significant difference for most of accommodation functions compared with predetermined values from previous study ($p<0.05$). The data presented in this study can be used as a baseline while diagnosing accommodation anomalies among Malaysian Chinese primary school-aged children.

Keywords: Accommodation Functions, Malaysian Chinese, Primary School Children

INTRODUCTION:

Accommodation is the process of optical system of the eyes varies its focal length in response to fixation changes either from near to far or far to near. During accommodation, the human eye changes its power by altering the shape of the crystalline lens, become thicker and more convex (Grosvenor, 2001; Dubbelman et al., 2005). Measurement of accommodation functions such as amplitude of accommodation, response of accommodation, facility of accommodation, and relative accommodation are crucial component while diagnosing non strabismic binocular vision anomalies especially accommodation anomalies.

There are various categories of accommodative anomalies which may be found in children. Thus, to diagnose accommodation anomalies, findings from visual screening will be compared with

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normative values found in textbook. Accommodation status normative values found in textbook have been used worldwide as guidelines to diagnose and treat accommodation anomalies (Scheiman & Wick, 2008). These normative values found in textbook are obtained mostly based on Caucasian data thus require different interpretation to take into consideration of the influence of the age and race factors (Chen & Hakimi, 2001). The effect of race has been reported to influence the accommodation norms especially during school age. Hence, norms from textbooks might require different interpretation for different races and there is a need for practitioners to exercise some caution in diagnosing accommodation dysfunction among different races.

Therefore, there is a demand for establishing normative data for accommodation function in Malaysian Chinese primary schoolchildren that had not been reported previously. The baseline normative value from this study might be used to a better interpretation in diagnosing binocular vision problems in Malaysian Chinese primary schoolchildren.

Methods

This cross sectional study was approved by the Institution Research and Ethics Committee. Fifty subjects were recruited in this study, which written consent was obtained from the respective school authority. The selection criterion was best corrected visual acuity is 6/6 or better and no previous history of ocular problems such as amblyopia or strabismus. History taking and visual acuity measurement using Snellen chart was done before accommodation parameter measurement. Measurement of accommodation parameter includes amplitude of accommodation (AA), response of accommodation, facility of accommodation, and relative accommodation. All parameters was examined under monocular and binocular viewing conditions, and performed under room illumination.

Procedures for accommodation measurements

Monocular and binocular AA was measured by Donder's push up method using Royal Air Force near point rule (RAF rule) while the subject wearing spectacle. Subjects were asked to fixate on N5 target of RAF rule at distance of 50 cm. The target was moved closer to the subjects until they reported first sustained blur, and this point recorded in dioptre as AA. The test was done monocularly, and then binocularly.

Response of accommodation was measured by Modified Estimation Method (MEM) using retinoscope and near card at distance of 40 cm. While the subjects read the words on the near card, retinoscopy was performed along horizontal axis, and the spherical power in dioptre (D) needed to neutralize the light reflex movement was recorded as response of accommodation.

Facility of accommodation was measured with ±2.00D flipper lens, while subjects fixating N5 target on near chart at 40 cm. Subjects were asked to clear the target with +2.00D first and then -2.00D alternately within one minute. The flipper lens was introduced on right eye and then both eyes to measure monocular and binocular facility of accommodation respectively. The number of cycles per minute (cpm) was recorded.

Relative accommodation was measured with minus and plus lenses. Subjects were asked to fixate at the one line larger than near visual acuity font at 40 cm. The power of spherical lenses was gradually added by 0.25D step until subject reported first sustain blur. Plus lenses were used first, followed by minus lenses to measure negative relative accommodation (NRA) and positive relative accommodation (PRA) respectively.

Result

Demography details such as age and gender for 50 subjects aged 8 to 12 years old with mean 10±1 years are presented in Table 1.

Normative value (mean and standard deviation) for accommodation parameters measured such as monocular and binocular AA, response of accommodation, monocular and binocular facility of accommodation and relative accommodation are given in Table 2.

One-way between groups ANOVA was done to compare variation of all accommodation parameters across different age group. The test showed variation between age groups for monocular and binocular AA. However, no significant variation found for response of accommodation. Similar results found for monocular and binocular facility of accommodation, and relative accommodation.

Comparison of normative values from this study with predetermined values from gold standard reference was done by using one sample t-test. Figure 1 shows the result of average monocular and binocular AA have significant different with average predetermined values of AA. Similar results found for other accommodation parameters except relative accommodation (Figure 2).

Table 1: Mean and SD of age and gender distribution

Gender	Subject (n)	Age (years) Mean ± SD
Male	25	9.8 ± 0.87
Female	25	9.4 ± 1.44

Table 2: Mean and SD for accommodation parameters in Malaysian Chinese primary schoolchildren and comparison across age groups

Parameters (unit)	Mean ± SD	P value
Monocular AA (D)	11.23 ± 1.76	0.024
Binocular AA (D)	11.36 ± 2.27	0.028
Response of accommodation (D)	+0.94 ± 0.18	0.05
Monocular facility of accommodation (cpm)	10.48 ± 2.57	0.464
Binocular facility of accommodation (cpm)	8.34 ± 2.28	0.520
Positive relative accommodation (D)	-2.44 ± 0.96	0.628
Negative relative accommodation (D)	+2.42 ± 0.51	0.117

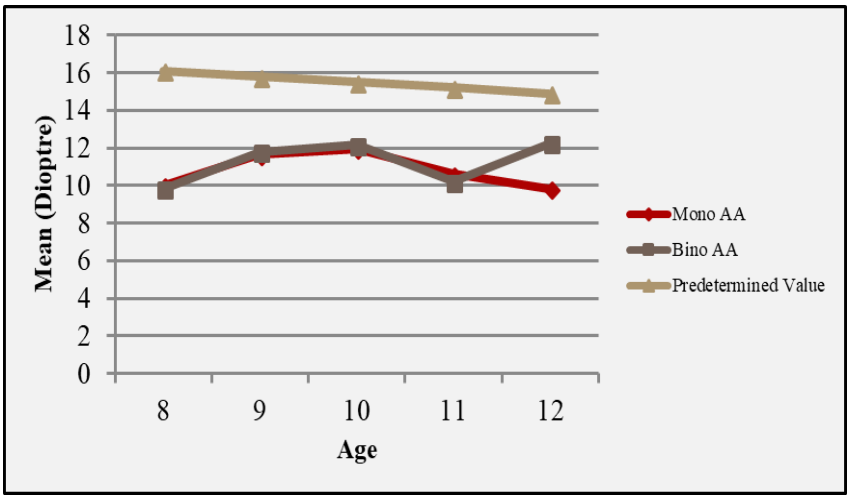

Figure 1: Comparison of average monocular and binocular AA from current study with predetermined value from gold standard reference

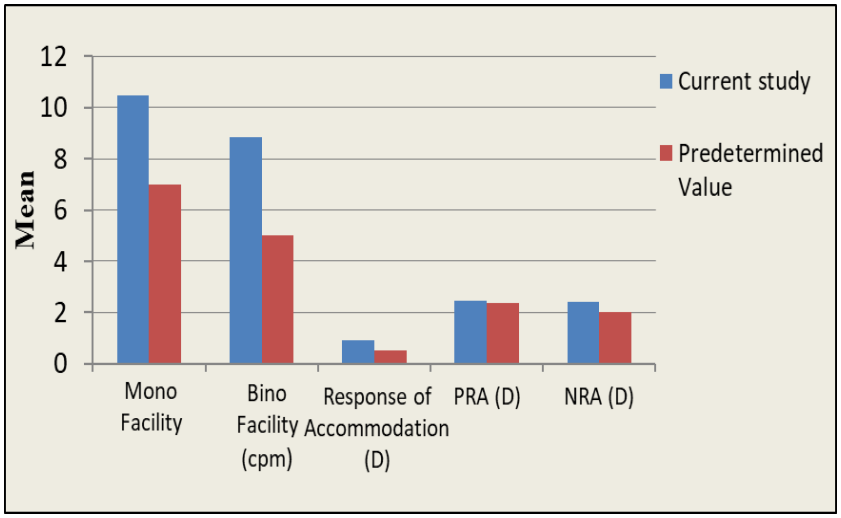

Figure 2: Comparison of normative values of facility of accommodation, response of accommodation and relative accommodation from current study with predetermined values from gold standard reference

Discussion

From this study, there is no significant variation for accommodation function such as response of accommodation, facility of accommodation, and relative accommodation across age groups, except for monocular and binocular AA. This result showed that AA is highly sensitive with changes of age compared to other accommodation functions.

Average monocular and binocular AA found in this study lower than average expected AA calculated using Hofsetter's equation. There is no specific evidence that genetic factor might influence AA but environmental factor was believed to have an influence on variation of AA (Ovenseri-Ogbomo et al. 2012). People living in warmer regions have an earlier onset of presbyopia compared to people who live in colder region as aging process of crystalline lens in warmer region is higher (Miranda, 1979). In this study, binocular AA was slightly higher than monoculae AA which is parallel with findings by all researchers, justified by influence of convergence of the eyes cause the AA to increase.

The response of accommodation found in this study was +0.93±0.18D, significantly weaker than normative value reported by gold standard reference (Scheiman & Wick, 2008). This result also weaker than normative value measured on Malay primary schoolchildren, which is +0.44±0.27D (Chen & Hakimi, 2001). In this study, the lower amount of AA compare to expected values might influence the response of accommodation. Monocular and binocular facility of accommodation found in this study is 10±2.5 cpm and 8±2.2 cpm respectively, which is slightly higher compared to predetermined values (Scheiman et al., 1988). This result is parallel with finding from other study which measured on Malay schoolchildren population in Malaysia (Chen & Hakimi, 2001). PRA and NRA in this study were -2.44±0.96D and +2.42±0.51D respectively, higher than the predetermined values reported by Scheiman & Wick (2008). However, the differences were not significant. The value of relative accommodation depends on two factors, which are AA and the range of fusional vergence (Grosvenor, 1996). The slightly higher relative accommodation found was most likely due to younger subjects recruited in this study.

Conclusion

In summary, there is significant difference for most of accommodation functions from current study with predetermined values from gold standard reference. Thus, the data presented in this study can be used as baseline while

diagnosing accommodation anomalies among Malaysian Chinese primary school-aged children.

References

1. Borsting E. Rouse M.W., Deland P.N., Hovett S., Kimura D., Park M., & Stephens B. (2003). Association of symptoms and convergence and accommodative insufficiency in school-age children. *Optometry 74,* 25-34.
2. Chen, A. H., & Abidin, A. H. Z. (2002). Vergence and accommodation system in Malay primary school children. *Malaysian Journal of Medical Sciences, 9*(1), 9-15.
3. Castagno, V. D., Vilela, M. A. P., Meucci, R. D., Resende, D. P. M., Schneid, F. H., Getelina, R., & Fassa, A. G. (2016). Amplitude of Accommodation in School-children. *Current Eye Research*, 1-7.
4. Dubbelman, M., Van der Heijde, G. L., & Weeber, H. A. (2005). Change in shape of the aging human crystalline lens with accommodation. *Vision research*, *45*(1), 117-132.
5. Edwards, M.H., Law, L.F., Lee, C.M., Leung, K.M., & Lui, W.O. (1993). Clinical norms for amplitude of accommodation in Chinese. *Ophthal Physiol Opt., 13*, 199-204.
6. Grosvenor, T. (2001). *Primary care optometry*. Elsevier Health Sciences.
7. Metsing, I. T., & Ferreira, J. T. (2012). Accommodation and vergence status among the 3rd and 4th graders in a mainstream school in Gauteng. *African Vision and Eye Health*, *71*(1), 22-31.
8. Miranda MN. (1979). The geographical factor in the onset of presbyopia. *Trans Am Ophthalmol Soc*, *77*, 603–621.
9. Ovenseri-Ogbomo, G. O., Kudjawu, E. P., Kio, F. E., & Abu, E. K. (2012). Investigation of amplitude of accommodation among Ghanaian school children. *Clinical and Experimental Optometry*, *95*(2), 187-191.
10. Scheiman, M., & Wick B. (2008). *Clinical Management of Binocular Vision: heterophoric, accommodative, and eye movement disorders*. Philadelphia: JB Lippincott Company.
11. Sterner, B., Gellerstedt, M., & Sjöström, A. (2004). The amplitude of accommodation in 6–10-year-old children–not as good as expected!. *Ophthalmic and Physiological Optics*, *24*(3), 246-251.