



Development of visual acuity in elementary school children by gender difference

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Abstract: The visual acuity, diopter, and visual function of the children in the primary school in Taichung were investigated, the differences in the visual performance between different genders were also discussed. Experimental results showed that the negative refractive errors in equivalent spherical power for the male schoolchildren was more than the female schoolchildren. Although the average power was not up to the myopia level, it may be occurred in the future. For the difference in gender, it was speculated that the different life styles. In this era of electronic products, male students of this age may have a higher percentage of obsessed with In the case of video games or mobile games, and resulted in such differences.

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Keywords: visual acuity, diopter, visual function

1. Introduction

In 2016, Brien Holden et al. published a investigation of the global myopia rate. From 2000 to 2010, the global myopia population has risen from 1.406 billion (22.9% of the global population) to 1.95 billion (accounting for the global population). The population is 26.8%. In 2020, it was estimated that the myopic people will reach 2.62 billion (accounting for 34.0% of the global population). By 2050, it was estimated that half of the world's population will face myopia problem [1]. This shows that the rapid rate of myopia population Growth is a public health issue that all countries should pay attention to; in East Asia where Taiwan is located, the average myopia rate of school-age children is about 73% [2], which is the highest in the world, and Taiwan's myopia rate in this region is still the top three. Among them, according to the "106 Children and Adolescents Eyesight Monitoring Survey" carried out by the National Health Administration commissioned by the National Taiwan University School of Medicine, the myopia rates of the first and second grade of students in the elementary school were 19.8% and 38.7% respectively. The myopia rate of junior high school students is as high as 89.3%, and the myopia rate of junior high school children is 87.2%. From this data, we can see that all age groups in Taiwan are facing the problem of myopia. It is a normal phenomenon; therefore, vision care in the lower grades is a very important task for the follow-up prevention and treatment of myopia.

2. Materials and Methods

This study investigated the visual acuity, refractive power, and visual function of children in the lower grades of an elementary school in central Taiwan, and explored whether there are differences in the above-mentioned visual performance between different genders.

(1) Visual acuity

In this study, the standard 6 m Snellen visual acuity chart was used to measure the visual acuity of the subjects. Since most subjects were not wearing corrective prescriptions, except for some subjects with refractive errors, the naked vision and post-correction were measured. Visual acuity, most subjects only measure naked visual acuity.

(2) Diopter

In this study, the spherical dioptric power and astigmatism of each subject in the non-mydiatic state were measured by a computerized refractor.

(3) Stereo vision

In the state of the subject's vision correction at a short distance (40 cm), the Stereopsis Butterfly Randot book and polarized glasses were used to test the subject's best stereo vision.

(4) Eye movement ability

Use the short-distance optotype and move the near-distance optotype in six directions up, down, left, right, top right, bottom right, top left, and bottom left at a distance of 40 cm from the subject to detect whether the subject can track and gaze at the optotype

in any direction to determine whether the subject's eye movement ability is normal. If the subject can track and gaze at the optotype in any direction, it will be recorded as SAFE. If any direction cannot be completed, record the position.

(5) Statistical methods

This study uses each eye as a single data, using Microsoft Excel 2016 to collate and use IBM SPSS Statistics 24.0 for data analysis. The independent sample T test was used to analyze whether the tested data has reached a significant difference between the male and female groups. The correlation between diopter and visual acuity is analyzed by Pearson's correlation coefficient. In this study, the visual acuity value is analyzed in logarithmic form (Log MAR), the diopter is expressed in the form of Spherical Equivalent Power (SE), and the degree of astigmatism is converted into an angle of 0 degrees (J0) and 45 degrees (J45) for analysis.

3. Results and Discussion

Figure 1 shows the average value of various eye parameters measurement among the primary school children. The total number of male and female children included in the statistics is 68. Spherical diopter (SE), astigmatism power (Cyl) at 0 degrees (J0) and 45 degrees (J45), and the average value of naked visual acuity (VAsc) are measured. It can be seen that boys have a deeper diopter at this stage than girls. Although the average value has not yet reached the standard for myopia, there is still a clear trend toward myopia. In addition, the normal number of extraocular muscle movement (EOM) in each group, regardless of whether it is male or female, most school children have reached the normal standard for eye movement at this age. Figure 2 shows the distribution of the equivalent spherical diopter of the right eye of the primary school children. The diopters are distributed between +0.25 D and 0 D. There are 26 people of the subjects, and most of the children are still in the standard diopter, but there are also 17 schoolchildren whose myopia diopter has exceeded -1.00 D; Figure 3 shows the distribution of the equivalent spherical diopter of the right eye of schoolchildren. For the right eye, female schoolchildren's degrees are mostly distributed in a few positive diopter, while on the contrary, male schoolchildren mostly have myopia diopter.

Figure 4 shows the distribution of the equivalent spherical power of the left eye. Same as the right eye, many children still have some positive diopter. The equivalent spherical power +0.25 D to 0 D is the interval with the largest number of people. There are 27 students in total, but there are still some children whose myopia degrees have exceeded -1.00 D (22 in total); Figure 5 shows the distribution of the diopter of

male and female students in this age group, and the equivalent spherical diopter between +0.25 D to 0 D for the amount of female is 18, and most male schoolchildren have negative diopter. A total of 25 male schoolchildren have equivalent spherical diopter of more than -0.50 D, and 13 people have a diopter exceed -1.00 D.

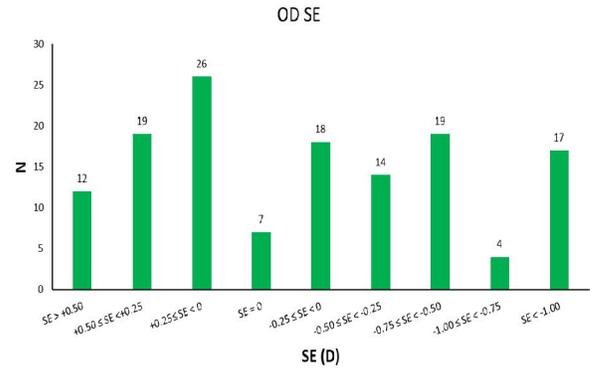


Fig. 1. The average value of various eye measurement parameters among the primary school children.

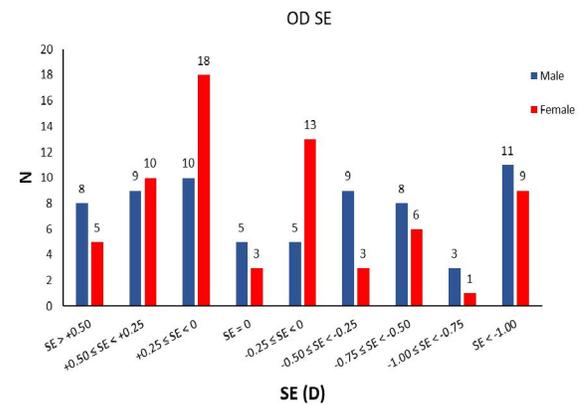


Fig. 2. Distribution of the equivalent spherical diopter of the right eye of male and female schoolchildren.

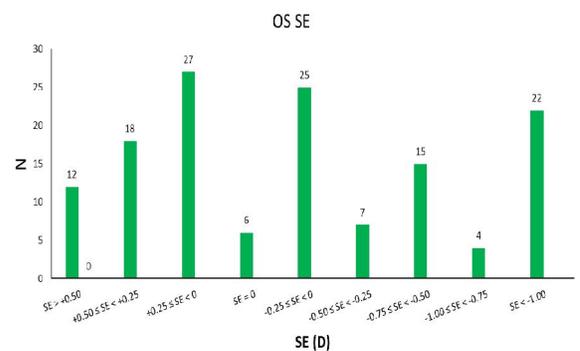


Fig. 3. Equivalent spherical diopter of left eye

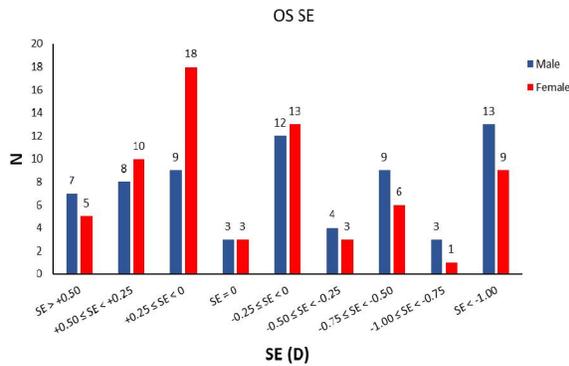


Fig. 4. Distribution of the equivalent spherical diopter of the left eye of male and female schoolchildren.

4. Conclusions

This study investigates the visual acuity, diopter, and visual function of children in the lower grades of an elementary school in central Taiwan, and explores whether there are differences in the above-mentioned visual performance between different genders. The experimental results show that male students in the lower grades of this country have more negative refractive errors in the equivalent spherical power than female students. Although the average diopter is still up to the standard for myopia, it may be in the future It will develop into a warning sign of myopia; as for the difference in gender, it is speculated that it may be caused by a difference in life style. In this age of electronic products, a higher proportion of male school

children of this age may be addicted to in the case of video games or mobile games, long-term use of eyes at close range may cause such a difference.

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