

## Relation of Refraction Abnormalities and Nutritional Status with Learning Achievement in Covid-19 Pandemic Era

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### ABSTRACT

*Refraction abnormalities are the second most common cause of limited vision after cataracts and being a health problem around the world, including Indonesia. Vision is the main factor of information input and learning process. Vision ability develops optimally until the age of 9 years, delays in refraction correction can cause reduced ability to absorb learning material and further will have an impact on learning achievement. However in pandemic era, learning system is turn into online system. Another factor that affects it is nutritional status, a body state caused by a balanced nutrient intake and needs. This study aims to prove the theory of the effect of refractive errors, nutritional status, on learning achievement. A cross-sectional design that linked refractive errors (myopia, hypermetropia, astigmatism) and nutritional status to learning achievement in elementary school student. The sample consisted of 26 students in grades 3-6. The refractive spearman test with learning achievement got a significance value of 0.733( $p>0.05$ ), while nutritional status and learning achievement has a significance value of 0.679( $p>0.05$ ) which means there are no meaningful relationship in both variable with learning achievement. Multivariate analysis was not performed because of the bivariate analysis were not significant. There was no correlation between students' refractive abnormality and nutritional status with their learning achievement in pandemic era.*

## BACKGROUND

Refractive disorders are one of the most frequent eye disorders and are still a public health problem around the world, including Indonesia (Rumondor & Rares, 2014). The refractive disorders in question are myopia, hypermetropia, and astigmatism (Pristiwatin et al., 2013). The eyes are said to be normal with 6/6 visual acuity, while the eyes with mild visual impairment if the visual acuity is  $\leq 6/9$ . It is said to have low vision if the visual acuity is between 6/18 to 3/60, and blind if you have visual acuity  $< 3/60$  (Joseph, 2014). According to the basic health research (RISKESDAS) in 2013 in Central Java, the percentage of *severe low vision* is 1,1 % of the total population, or around 329.428 inhabitants who have limited vision. This becomes the focus of the problem so that an active role is needed in preventing and overcoming visual disturbances.

Research conducted by Dobewall et al. (2019) stated that children's health affects their academic achievement in school. Children with lower health levels have worse academic performance than healthy children. Children's eye health has a major effect on student achievement in terms of the ability to process information obtained at school (White et al., 2017; Wood et al., 2018; Hopkins et al., 2019).

This research is reinforced by research conducted by Kirag and Temel in 2018 in Turkey which found that there is a significant relationship between refractive disorders that interfere with vision and learning achievement of children at school. Research in Nigeria shows that the high number of children suffering from refractive errors and undetected will indirectly affect children's development in school (Ezinne & Mashige, 2018)

Vision screening and correct eye examination will increase the activity of daily life and quality of life of children who suffer hypermetropia. Hypermetropia sufferers are associated with the child's learning process (Akuta, 2015).

Research on students of Eben Haezar 2 Christian Middle School Manado, Indonesia in 2014 showed that refractive errors were significantly related to learning achievement (Rumondor & Rares, 2014). On the other hand, research on outstanding students of Panca Budi Primary School Medan in 2015 and 106 Primary School Pekanbaru in 2017 did not find any significant effect between refractive errors and achievement levels (Lubis, 2015; Wardany et al., 2018).

Another health factor that affects learning achievement is nutritional status. Nutritional

status is a state of the body caused by a balance between nutrient intake and needs. This balance can be seen from the growth variables, namely body weight, height/body length, head circumference, upper arm circumference, and chest circumference (Supriasa, 2012). Providing malnutrition, especially for children and adolescents, will reduce the potential of community development resources (Cakrawati, 2012).

## METHOD AND MATERIAL

This type of research is an analytic observational study with a *cross-sectional* approach. The research was carried out at Muhammadiyah 13 Elementary School, Serengan District, Surakarta City in April 2020. The sampling technique used a *total sampling* of all students in grades 3-6 Muhammadiyah 13 Elementary School. This research involved 26 students. Students who were not present at the time of the study, vision did not progress with pinhole examination, sufferers of organic eye disease, already wearing glasses and corrected properly, and following tutoring were not involved in this study.

The measuring instrument used in measuring student achievement is the average semester report cards. The independent variable uses the Snellen chart and pinhole measuring instruments for the diagnosis of

refractive errors, a measuring device for measuring body weight and microtois to measure nutritional status. After the data was collected, the researcher conducted a univariate analysis which aimed to determine the distribution and percentage of each variable. The bivariate analysis with Spearman non parametric test in order to determine the relationship between refraction abnormalities and learning achievements as well as the relationship between nutritional status and learning achievement. The data obtained from the research will be processed with Statistical Product and Service Solution (SPSS) 20 for Windows software.

## RESULTS AND DISCUSSION

The results of the observation showed that the research samples varied from 9 to 12 years of age. Most of the sample was 9 years old, as many as 9 students (34.6%). More samples were male, amounting to 16 (61.5%). Description more research variables is the result of the univariate analysis can be seen on Table 1

**Table 1.** Characteristics of Research Subjects

| Variable     | Frequency<br>n (%) | Mean |
|--------------|--------------------|------|
| Age          |                    |      |
| 9 years      | 9 (34,6)           |      |
| 10 years     | 5 (19.2)           |      |
| 11 years old | 6 (23.1)           |      |
| 12 years old | 6 (23.1)           |      |

| Variable                  | Frequency<br>n (%) | Mean  |
|---------------------------|--------------------|-------|
| Gender                    |                    |       |
| Man                       | 16 (61.5)          |       |
| Women                     | 10 (18.5)          |       |
| Nutritional status        |                    |       |
| Enough                    | 20 (76.9)          | 12.6  |
| Thin                      | 3 (11.5)           | 16.7  |
| Fat                       | 3 (11.5)           | 24.5  |
| Oculi Dextra              |                    |       |
| Normal                    | 8 (30.8)           |       |
| Refraction Abnormalities  | 17 (65.4)          |       |
| Not a refractive disorder | 1 (3.8)            |       |
| Oculi Sinistra            |                    |       |
| Normal                    | 13 (50)            |       |
| Refraction Abnormalities  | 9 (34,6)           |       |
| Not a refractive disorder | 4 (15.4)           |       |
| Achievement               |                    |       |
| Enough (41 - 60)          | 2 (7,7)            | 69.3  |
| High (61 - 80)            | 13 (50)            | 75.72 |
| Very High (81 - 100)      | 11 (42.3)          | 85.47 |

The majority of the nutritional status of research subjects enough, as many as 20 students (76,9%) with a mean of 12.6 kg/m<sup>2</sup>. Visual examination found that most of the samples had refractive errors in the right eye totaling 17 students (65.4%). In the left eye the majority of the sample had normal vision, namely 13 (50%), followed by refractive errors of 9 students (34.6%). The distribution of learning achievement varies. The majority of the sample has high learning achievement, as many as 13 students (50%). The results of the spearman test relation between refraction and achievement are written on Table 2.

**Table 2.** Results of the Spearman Test Relation between Refraction and Achievement

|                             |             | Refraction | Achievement |
|-----------------------------|-------------|------------|-------------|
| <b>Spearman correlation</b> | Refraction  | 1,000      | 0.070       |
|                             | Achievement | 0.070      | 1,000       |
| <b>Sig. (1-tailed)</b>      | Refraction  | 0.0        | 0.733       |
|                             | Achievement | 0.733      | 0.0         |

From the table of the relation between refraction and achievement above, it is known that the significance value is 0.733 ( $p > 0,05$ ) which means that there is no significant relationship between refraction and achievement. Based on the results of the Spearman correlation, it can be concluded that the Spearman correlation ( $\rho$ ) is 0.070 which is very weak. Thus,  $H_0$  is accepted and  $H_a$  is rejected, meaning that there is no significant and unidirectional relationship between refractive errors and learning achievement.

The results of this study are in accordance with research conducted on outstanding students of Panca Budi Primary School Medan in 2015 and 106 Primary School Pekanbaru in 2017. The two studies also did not find a significant relationship between refraction abnormalities and achievement levels (Lubis, 2015; Wardany et al., 2018). Researchers assume there are other factors or causes that influence more to student achievement.

This research was conducted during the Covid-19 pandemic. Pandemic Covid-19 experienced by all parts of the world,

including Indonesia, making the journey of student teaching and learning activities must be changed to an online system (Republik Indonesia, 2020). Since March 2020 the face-to-face learning system for students has been changed to an online system so that learning evaluations are also carried out on an online basis (Kementerian Pendidikan dan Kebudayaan Republik Indonesia, 2020).

Several studies have stated that online learning systems are more effective than offline systems because they are considered to provide more flexibility and comfort to students so as to accelerate the absorption of information in the classroom (Bogdănici, Săndulache, & Nechita, 2017; Hart et al., 2019). On the other hand, the online system requires the child to stare at the gadget screen for a long time that can lead to refractive errors. Research conducted on 418 students in Ireland by McCrann (2020) found that using gadgets for more than 4 hours 25 minutes per day increases the risk of suffering from myopia. Meanwhile, the online learning system in Indonesia during this pandemic took more than 4 hours per day, thus increasing the risk of astigmatism and myopia disorders.

Research conducted by Aman y & Sekartini (2017) found that children's nutritional status was significantly related to primary school student learning achievement. The research was conducted by measuring

height and weight to classify children's nutritional status and collecting report cards to classify student achievement. In this study, the relationship between nutritional status and achievement using the Spearman statistical test is shown in Table 3.

**Table 3.** Spearman Test Results Relationship between Nutritional Status and Achievement

|                             |                    | Refraction Achievement |       |
|-----------------------------|--------------------|------------------------|-------|
| <i>Spearman correlation</i> | Nutritional status | 1,000                  | 0.085 |
|                             | Achievement        | 0.085                  | 1,000 |
| <i>Sig. (1-tailed)</i>      | Nutritional status | 0.0                    | 0.679 |
|                             | Achievement        | 0.679                  | 0.0   |

The significant value relationship nutritional status and achievement (in Table 3) was 0.679 ( $p > 0,05$ ), which means there is no significant relationship between nutritional status and achievements of respondents researcher 's with the results of the correlation Spearman ( $\rho$ ) of 0.085 which means very weak. Researchers assume that there are several other variables, such as learning methods, that need to be involved in further research.

Multivariate analysis was not carried out in this study because there was no significant correlation between refraction and student achievement and the relationship between nutritional status and student achievement. The researcher argues that further research is needed with more respondents and to minimize research confounding actors.

## CONCLUSION

The results of this study indicate that refractive abnormalities and nutritional status of students are not significantly related to student achievement. The results of this study are inconsistent with several previous studies, possibly due to uncontrolled confounding variables, such as age, gender, learning motivation, intelligence, environmental factors, habitual factors, subject matter, school management, pandemic conditions, and others.

This research can be developed by modifying several methods, such as increasing the number of samples and minimizing other confounding variables so that they can get better results.

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