Physical performance is associated with visual acuity in university students: results of a school-based study

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INTRODUCTION

Recently epidemiology studies have shown that most university students are not physically active1. Physical activity impacts health-related quality of life2, social problem-solving ability3, physical performance4, and obesity5. There was a higher prevalence of reduction of visual acuity in students from a medical university in China6. A previous study found that children should remain the focus of detection and treatment of reduction of visual acuity7. However, little is known about the relationship between physical performance and visual acuity in university students.

In the present study, our objective was to evaluate the relationship between physical performance and visual acuity among university students from a university in China.

METHODS

Participants

This cross-sectional study was conducted in university students recruited for a physical-fitness test in 2012 – which was described in a previous study8.
A total of 2313 subjects (978 males and 1335 females) were recruited. All students agreed to provide their personal information related to the scope of this study. This study was also approved by the Wannan medical college ethics committee.

**Criteria for inclusion and exclusion**

Students who had a serious disease that influenced physical activity were excluded from this study.

**Physical-fitness test**

All students took part in standing long jump, 50-meter dash, and pull-ups/sit-ups tests. We recorded the time of the 50-meter dash and the number of pull-ups/sit-ups. For the standing long jump, students had three attempts, and the best result was recorded. We recorded the number of pull-ups for male students and the number of sit-ups for female students.

**Visual acuity-test**

The visual acuity was measured using a logarithm of the minimum angle of resolution (logMAR) chart by staff trained, which is the “gold standard” by which the outcomes of the vast majority of clinical trials or interventions were assessed, and each eye was measured separately (using the Standard for Logarithmic Visual Acuity Charts, GB 11533-1989, GB/T 11533-2011 of the Standardization Administration of the People’s Republic of China). The uncorrected visual acuity was used in this study. The examination was performed under the condition of no direct sunlight and shadows.

**Statistical analysis**

R software was used to describe the physical performance and vision among university students. Pearson correlation was used to test the correlation of physical performance with visual acuity in university students. A P-value of less than 0.05 was considered statistically significant.

**RESULTS**

A total of 2313 participants (978 males and 1335 females) aged from 19 to 23 years old were admitted into our study. The mean of visual acuity is shown in table 1. Table 2 shows the correlation between physical performance and visual acuity for male students. The results showed that the number of pull-ups was negatively associated with visual acuity in the left eye. However, the correlation between the time of the 50-meter dash and the distance of the standing long jump with visual acuity in the left eye was not significant, and no significant correlation was found between physical performance and visual acuity in the right eye. There was a negative correlation between the time of the 50-meter dash and visual acuity in the right eye, and a positive correlation between the number of sit-ups and visual acuity in the right eye, while no significant correlation was found between performance and visual acuity in the left eye.
DISCUSSION

Our present study shows there are significant differences in visual acuity between male and female students. The results of our study are consistent with previous ones in which there were more females with poor vision than males\(^{10}\). The possible reason may be that female students work harder than male students in China, which leads to a reduction of visual acuity.

We also found that the number of pull-ups was negatively associated with visual acuity in the left eye for male students. While a negative correlation between the time of the 50-meter dash and visual acuity in the right eye was found for female students. A possible reason for this may be that there are differences in the choice of sports activities between male and female students. Our cross-sectional study found that physical performance was associated with visual acuity, which provides a possible strategy for preventing vision damage via strength training physical activity.

There are also some limitations to the present study. It is cross-sectional, which limits explanations for causal-results relationships. Additionally, some variables (dietary, economic factor) that may affect vision were not included.

CONCLUSION

Our study suggests that physical exercise is associated with visual acuity. However, cause-results relationships also need to be confirmed.

Author Contributions

Conceptualization, Koulong Wu and Liu Yang; formal analysis, Koulong Wu; writing—original draft preparation, Liu Yang; writing—review and editing, Lianping He; supervision, Tianhua Du; funding acquisition, Tianhua Du.

TABLE 3. CORRELATION BETWEEN PHYSICAL PERFORMANCE AND VISUAL ACUITY FOR FEMALE STUDENTS

|                        | 50-meter dash | Standing long jump | Sit-up | Left eye | Right eye |
|------------------------|---------------|--------------------|--------|----------|-----------|
| **Pearson Correlation**| 1             |                    |        |          |           |
| Sig. (2-tailed)        |               |                    |        |          |           |
| N                      | 1389          |                    |        |          |           |
| **Pearson Correlation**| -.223**       | 1                  |        |          |           |
| Sig. (2-tailed)        | .000          |                    |        |          |           |
| N                      | 1387          | 1474               |        |          |           |
| **Pearson Correlation**| -.179**       | .187**             | 1      |          |           |
| Sig. (2-tailed)        | .000          | .000               |        |          |           |
| N                      | 1384          | 1468               | 1470   |          |           |
| **Pearson Correlation**| -.047          | .005               | .048   | 1        |
| Sig. (2-tailed)        | .083          | .844               | .065   |          |           |
| N                      | 1386          | 1471               | 1467   | 1481     |
| **Pearson Correlation**| -.080**       | -.019              | .064*  | .820**   | 1         |
| Sig. (2-tailed)        | .003          | .460               | .014   | .000     |           |
| N                      | 1386          | 1471               | 1467   | 1480     | 1481     |

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

RESUMO

OBJETIVO: O objetivo deste estudo é explorar a relação entre desempenho físico e acuidade visual em alunos universitários da China.

MÉTODOS: testes de salto em distância em pé, corrida de 50 metros, flexões e abdominais foram realizados. A acuidade visual foi medida através de um logaritmo do quadro de ângulo mínimo de resolução (logMAR). A correlação de Pearson foi utilizada para testar a correrelação entre o desempenho físico e a acuidade visual em alunos universitários.

RESULTADOS: O número de flexões apresentou uma associação negativa com a acuidade visual do olho esquerdo em estudantes do sexo masculino e uma correlação negativa foi encontrada entre o tempo da corrida de 50 metros e a acuidade visual do olho direito em estudantes do sexo feminino.

CONCLUSÃO: O nosso estudo identificou que o exercício físico pode ajudar a aumentar a acuidade visual. Os estudantes universitários devem praticar musculação para melhorar o desempenho físico.

PALAVRAS-CHAVE: Desempenho físico funcional. Acuidade visual. Estudantes.
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