ORIGINAL ARTICLE

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

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SUMMARY

OBJECTIVE: *The aim of our study is to explore the relationship between physical performance and visual acuity in university students in China.*

METHODS: *tests of standing long jump, 50-meter dash and pull-ups sit-ups were conducted. The visual acuity was measured using a logarithm of the minimum angle of resolution (logMAR) chart. Pearson correlation was used to test the correlation of physical performance with visual acuity in university students.*

RESULTS: *The number of pull-ups was negatively associated with visual acuity in the left eye for male students, while a negative correlation was found between the time of the 50-meter dash and visual acuity in the right eye for female students.*

CONCLUSIONS: *Our study identified that physical exercise might help improve visual acuity. University students should practice strength exercises to improve physical performance.*

KEYWORDS: *Physical functional performance. Visual acuity. Students.*

INTRODUCTION

Recently epidemiology studies have shown that most university students are not physically active[1]. Physical activity impacts health-related quality of life[2], social problem-solving ability[3], physical performance[4], and obesity[5]. There was a higher prevalence of reduction of visual acuity in students from a medical university in China[6]. A previous study found that children should remain the focus of detection and treatment of reduction of visual acuity[7]. 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 study[8].

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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)[9]. 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. Table 3 shows the correlation between physical performance and visual acuity for female students. 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.

TABLE 1. COMPARISON OF MEASUREMENT VALUES FOR VISUAL ACUITY BETWEEN MALE AND FEMALE STUDENTS

Variable	Male		Female		t	P
	Mean	SD	Mean	SD		
Left eye	5.52	0.42	4.57	0.39	2.57	0.010
Right eye	4.48	0.43	4.54	0.40	3.47	0.001

TABLE 2. CORRELATION BETWEEN PHYSICAL PERFORMANCE AND VISUAL ACUITY FOR MALE STUDENTS

		50-meter dash	standing long jump	pull-ups	Left eye	Right eye
50-meter dash	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	1025				
standing long jump	Pearson Correlation	-.240**	1			
	Sig. (2-tailed)	.000				
	N	1024	1118			
pull-ups	Pearson Correlation	-.166**	.314**	1		
	Sig. (2-tailed)	.000	.000			
	N	1020	1112	1117		
Left eye	Pearson Correlation	-.045	.017	-.064*	1	
	Sig. (2-tailed)	.147	.568	.032		
	N	1025	1117	1116	1124	
Right eye	Pearson Correlation	-.058	.026	.034	.795**	1
	Sig. (2-tailed)	.065	.387	.251	.000	
	N	1025	1118	1117	1124	1125

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

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

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

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.

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 correlação 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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