

(50)

Reading, writing, working on a computer or watching television, and myopia

Czytanie, pisanie, praca przy komputerze lub oglądanie telewizji a krótkowzroczność

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Summary:

Purpose: The aim of our study was to investigate on a large population if reading, writing, working on a computer or watching television might be associated with the occurrence of myopia.

Material and methods: A total of 5865 schoolchildren were examined (2792 boys and 3073 girls, at the age 6-18 years, mean age 11.9, S.D. 3.3). The examination included retinoscopy under cycloplegia induced with 1% tropicamide. Myopia was defined as a spherical equivalent of at least -0.50 dioptres. Mean refractive error was -1.2, SD 1.3. (The students and their parents completed a questionnaire on the child's visual work. Data analysis was performed using independence chi-squared Pearson test; p-values of <0.05 were considered statistically significant.

Results: It was observed that myopia occurs more often in students who read and write >2 hours/ day ($p < 0.001$), and also work >0.8 hours/ day on a computer ($p < 0.01$). Furthermore, no increase in the prevalence of myopia in subjects who spend >2 hours/ day watching television was found ($p > 0.05$).

Conclusions: The obtained results indicate that reading, writing, working on a computer might be associated with the occurrence of myopia among schoolchildren. Watching television is not related to the occurrence of myopia.

Słowa kluczowe:

krótkowzroczność, występowanie, praca wzrokowa.

Key words:

myopia, occurrence, visual work.

Introduction

In the contemporary world an increase of the prevalence of myopia can be observed. A significant increase in the occurrence of myopia has been noted in countries with a higher level of civilizational development. This might be linked to the increase of the amount of near work done by the population of these countries (1,2).

The data show that myopia occurs more frequently in people who read and write a lot and in those people who work a lot on a computer (1,3-8). However, there also have been published papers casting into doubt a link between myopia and reading, writing or working on a computer (6,9-13). It is accepted that watching television is not associated with the development of myopia (6,9).

Due to the differences of results in the published papers, the aim of our study was to investigate on a large population if reading, writing, working on a computer or watching television might be associated with the occurrence of myopia.

Material and methods

A total of 5865 schoolchildren were examined (2792 boys and 3073 girls, at the age 6-18 years, mean age 11.9, S.D. 3.3). The children examined, students of elementary and secondary schools, were Polish and resided in and around Szczecin, Po-

land. The students examined were Caucasian and there were no children of mixed ethnicity.

Participation was voluntary. Before beginning the examinations, the doctors met with the children, their parents or legal guardians and teachers. It was explained what the examinations were about. The children, parents or legal guardians and teachers had an opportunity to discuss the study with the experimenters prior to giving consent. Informed consent was obtained in each case from children, parents or legal guardians and school principals. The studies were approved by the Bioethics Committee of the Pomeranian Medical Academy. The research protocol adhered to the provisions of the Declaration of Helsinki for research involving human subjects.

The examination included retinoscopy under cycloplegia. Cycloplegia was induced with two drops of 1% tropicamide administered 5 min apart. Thirty minutes after the last drop, pupil dilation and the presence of light reflex was evaluated as later retinoscopy was performed. Retinoscopy was performed in a dark room and all schoolchildren were examined by the same doctors (AM and MU).

All refractive error readings were reported as spherical equivalent (SE) (sphere power plus half negative cylinder power). Myopia was defined as SE of at least -0.50 D. Mean refractive error was -1.2, S.D. 1.3. Both eyes were examined, but only data gathered from the right eye were analysed.

The students and their parents completed a questionnaire on the child's visual work. Data analysis was performed using independence chi-squared Pearson test; p-values of <0.05 were considered statistically significant.

Results

It was observed that myopia occurs more often in students who read and write ≥ 2 hours/day ($p < 0.001$) (Tab. I), and also work > 0.8 hours/day on a computer ($p < 0.01$) (Tab. II).

Furthermore, no increase in the prevalence of myopia in subjects who spend ≥ 2 hours/day watching television was found ($p > 0.05$) (Tab. III).

Reading and Writing (hours/day)/ Czytanie i pisanie (godziny/dni)	Myopia present/ Krótkowzroczność obecna n (%)	Myopia absent/ Krótkowzroczność nieobecna n (%)	Total/ Razem n (%)
< 2	93 (6.44)	1351 (93.56)	1444 (100.00)
2-3.5	269 (12.15)	1945 (87.85)	2214 (100.00)
> 3.5	360 (16.77)	1787 (83.23)	2147 (100.00)
Total	722 (12.44)	5083 (87.56)	5805 (100.00)

Tab. I. Reading, writing and myopia.

Tab. I. Czytanie i pisanie a krótkowzroczność.

Computer/ (hours/day)/ Komputer (godziny/dni)	Myopia present/ Krótkowzroczność obecna n (%)	Myopia absent/ Krótkowzroczność nieobecna n (%)	Total/ Razem n (%)
< 0.8	392 (11.45)	3033 (88.55)	3425 (100.00)
> 0.8	338 (13.85)	2102 (86.15)	2440 (100.00)
Total	730 (12.45)	5135 (87.55)	5865 (100.00)

Tab. II. Working on a computer and myopia.

Tab. II. Praca przy komputerze a krótkowzroczność.

Television (hours/day)/ Telewizja (godziny/dni)	Myopia present/ Krótkowzroczność obecna n (%)	Myopia absent/ Krótkowzroczność nieobecna n (%)	Total/ Razem n (%)
< 2	232 (13.76)	1454 (86.24)	1686 (100.00)
2-2.5	237 (11.46)	1831 (88.54)	2068 (100.00)
> 2.5	253 (12.34)	1798 (87.66)	2051 (100.00)
Total	722 (12.44)	5083 (87.56)	5805 (100.00)

Tab. III. Watching television and myopia.

Tab. III. Oglądanie telewizji a krótkowzroczność.

Discussion

It has been shown that lid forces during reading can change the lower and higher order aberrations of the eyeball. These changes are significantly larger in progressive myopia than em-

metropia (14). Recently, Collins et al. (15) examining lid-induced changes in corneal optics have demonstrated that reading and working on a computer may have different effects on both the characteristics and location of corneal topography changes. Reading usually exhibited larger and more centrally located changes, than computer work. The authors believe that lid-induced corneal aberration, which occur during reading and working on a computer may also play a role in myopia development.

It is accepted that reading and writing might be associated with a higher prevalence and greater progression of myopia (1,4-8). However, a few papers have also been published, which did not find any statistically significant relationship between myopia and writing (9,10). This was most likely caused by conducting the research on different populations and by using different examination methods.

However, the opinions on the influence of working on a computer and the prevalence as well as progression of myopia vary. The researchers believe that working on a computer influences the development of myopia (1,3). There also appear papers that do not find evidence for the influence of working on a computer on the development of myopia (6,11-13). These publications are the result of research carried out on adults in which the eyeball is fully developed and does not come under the influence of visual work on a computer.

Watching television is believed not to have an influence on the prevalence and progression of myopia (6,9). However, the incidence of myopia increases in children who watch TV from a close distance (1).

The results obtained by us are reliable because the examinations were carried out after inducing cycloplegia on a very large group of people. It should be also noted that studies were carried out on a racially and geographically homogeneity sample which eliminates some types of confounding. We have shown that reading, writing, working on a computer might be associated with the occurrence of myopia among schoolchildren. Moreover, it was determined that watching television is not related to the occurrence of myopia. The observed association may be explained in the changes in the range of accommodation or lid-induced changes in corneal optics.

Conclusions

The obtained results indicate that reading, writing, working on a computer might be associated with the occurrence of myopia among schoolchildren. Watching television is not related to the occurrence of myopia.

The paper was presented as electronic poster during 17th Congress of the European Society of Ophthalmology in Amsterdam, 13-16.06.2009.

Praca została zaprezentowana w formie plakatu elektronicznego na 17. Kongresie Europejskiego Towarzystwa Okulistycznego w Amsterdamie w dniach 13-16.06.2009.

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The study was originally received 21.09.2010 (1247)/
Praca wpłynęła do Redakcji 21.09.2010 r. (1247)
Accepted for publication 04.10.2010/
Zakwalifikowano do druku 04.10.2010 r.

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