

The role of reading, writing, using a computer, or watching television in the development of myopia

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ABSTRACT

INTRODUCTION. The purpose of our investigation was to evaluate in a Polish population the role of reading, writing, using a computer, or watching television in the development of myopia.

MATERIALS AND METHODS. In total 5601 students (2688 boys and 2913 girls, 6–18 years of age, mean 11.9 + 3.2 years) were examined. The children examined were Polish students of elementary and secondary schools. In every student cycloplegia after 1% tropicamide was performed. Non-parametric tests were used due to the SE distribution being significantly different from normal distribution in Kolmogorow-Smirnov test. Spearman rank correlation coefficient (Rs) was used to evaluate the strength of correlation between these variables. General linear model was used for multivariate analysis. A P-value less than 0.05 was considered significant.

RESULTS. It has been established that with the increase in time spent on reading and writing, the spherical equivalent (SE) of the examined students decreases (Rs = -0.16, p < 0.000001). It was observed that an increase in the time spent working on a computer correlates with the decrease of the SE (Rs = -0.11, p < 0.000001). No relationship between watching television and the spherical equivalent of the examined schoolchildren was found (Rs = +0.01, p = 0.31).

CONCLUSIONS. Reading, writing, or using a computer may lead to the development of myopia. Watching television has no influence on the incidence of myopia.

KEY WORDS: myopia, refractive errors, prevalence

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INTRODUCTION

Myopia is a serious unsolved health problem in the contemporary world. It is believed that over 22% of the current world population has myopia. This translates to 1.5 billion people. In many East Asian countries the prevalence of myopia is rising sharply and has already reached 70–80% of the population. In Western countries 25–40% of peo-

ple have myopia. In the United States the number of myopes has doubled in the past 30 years [1–3].

The incidence of myopia depends on genetic and environmental factors. An important environmental factor that influences the development of myopia is visual near work [4]. Many authors believe that reading, writing, and using a computer lead to a higher prevalence of myopia [5–16]. However,

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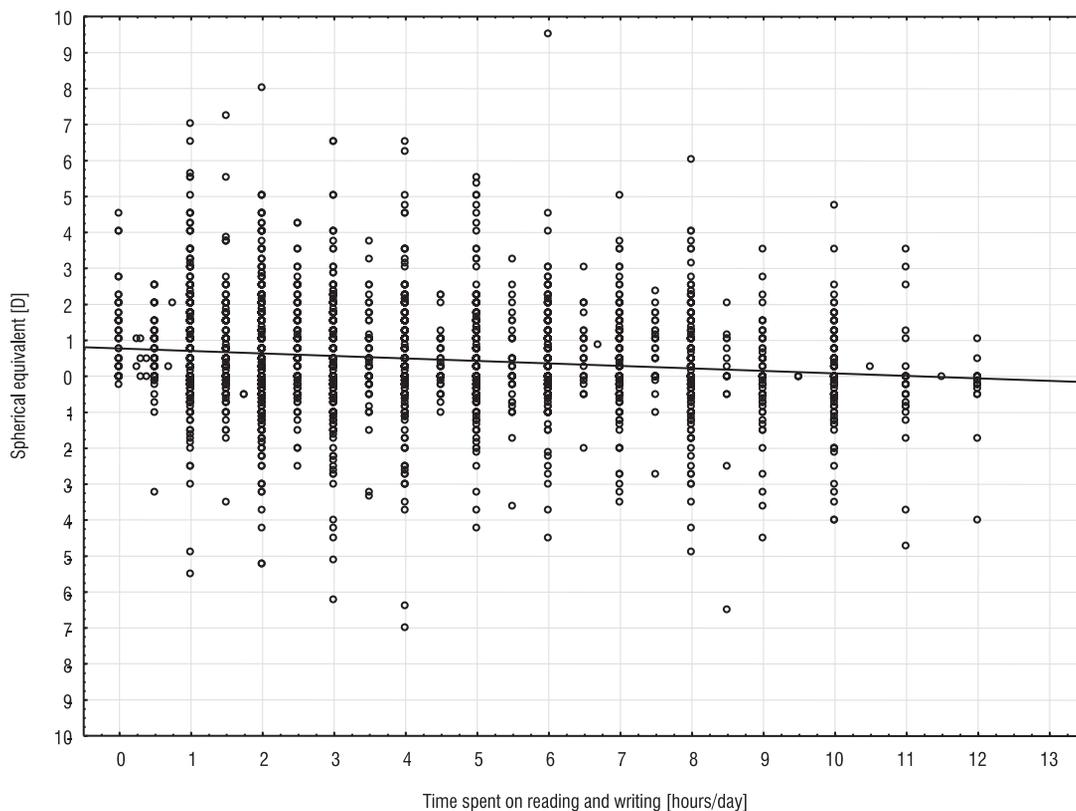


FIGURE 1. Mean spherical equivalent in relation to reading and writing

there have also been some publications that have not found such an association [17–23].

To the best of our knowledge only a few articles have been published so far that have studied the relationship between watching television and the development of myopia [6–10, 12, 13, 16, 17]. In the majority of these studies no dependency between watching television and myopia has been described [6, 7, 9, 17].

Because of the differences in the obtained data we decided to evaluate, in a Polish population, the role of reading, writing, using a computer, or watching television in the development of myopia.

MATERIALS AND METHODS

A total of 5601 students (2688 boys and 2913 girls, 6–18 years of age, mean 11.9 ± 3.2 years) were examined. The children examined (students of elementary and secondary schools) were Polish. In every student cycloplegia after 1% tropicamide was performed. The mean SE was calculated after examination of both eyes. The methods are described in detail in previous papers [6, 24].

The obtained results were entered into an EXCEL spreadsheet and analysed statistically using Statis-

tica 10 software. Non-parametric tests were used due to the SE distribution being significantly different from normal distribution in Kolmogorov-Smirnov test. Spearman rank correlation coefficient (R_s) was used to evaluate the strength of correlation between these variables. A general linear model was used for multivariate analysis. A P-value less than 0.05 was considered significant.

RESULTS

It was established that with increase in the time spent reading and writing, the spherical equivalent of the examined students decreases ($R_s = -0.16$, $p < 0.000001$) (Fig. 1).

It was observed that the increase in time spent using a computer correlates with the decrease of SE ($R_s = -0.11$, $p < 0.000001$) (Fig. 2).

No relationship between watching television and the spherical equivalent of the examined schoolchildren was found ($R_s = +0.01$, $p = 0.31$) (Fig. 3).

Multivariate analysis has shown that independent factors associated with lower SE values are: older age ($\beta = -0.26$, $p < 0.000001$), parents with myopia ($\beta = -0.15$, $p < 0.000001$), being female ($\beta = -0.036$, $p = 0.006$), longer time spent reading

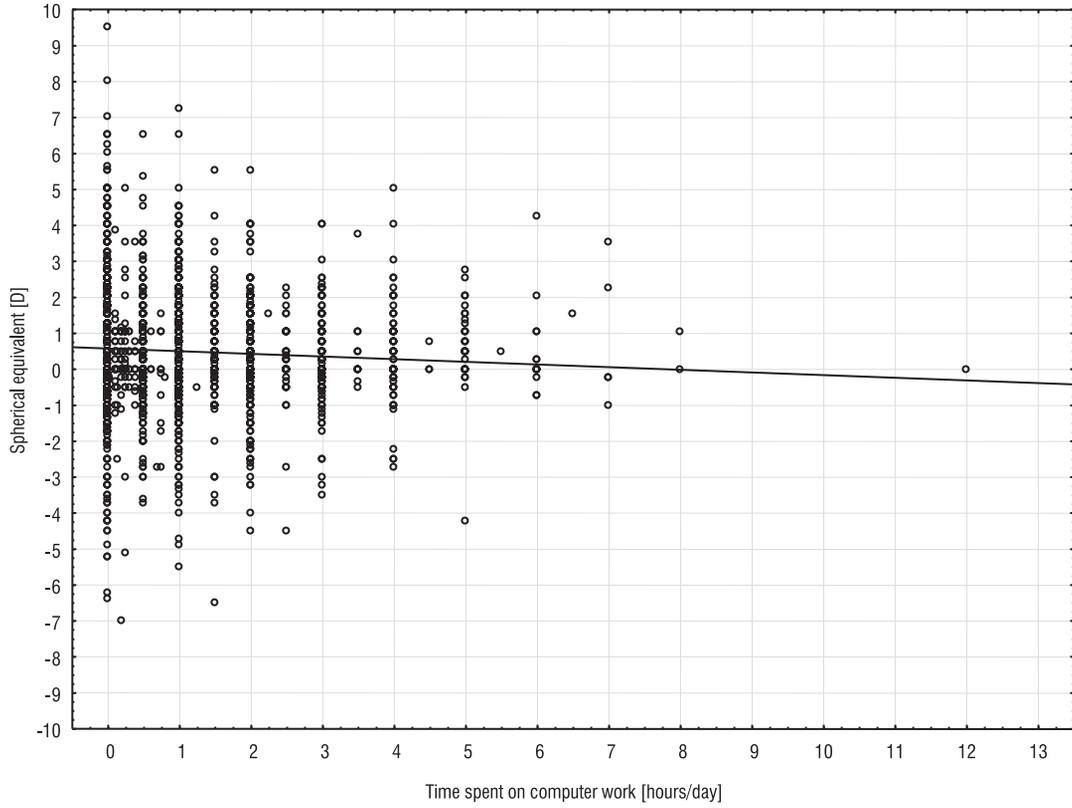


FIGURE 2. Mean spherical equivalent in relation to using a computer

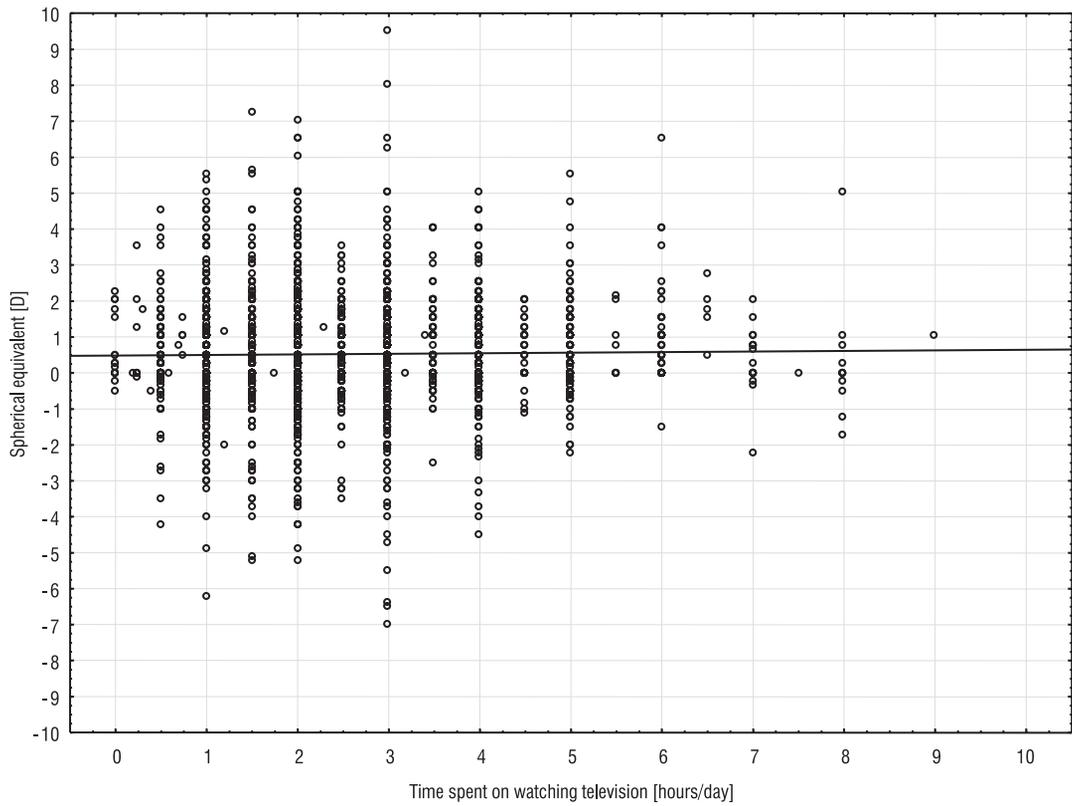


FIGURE 3. Mean spherical equivalent in relation to watching television

Table 1. Dependency between reading, writing, using a computer, watching television, and myopia

First author, year of publication	Country	Dependency between reading, writing, and myopia	Dependency between using a computer and myopia	Dependency between watching television and myopia
Nyman, 1988	Sweden		-	
Wong, 1993	Hong Kong	+		
Toppel, 1994	Germany		-	
Cole, 1996	Australia		+	
Mutti, 1996	USA		-	
Rechichi, 1996	Italy		-	
Kinge, 2000	Norway	+		
Saw, 2001	China	+		
Loman, 2002	USA	-		
Mutti, 2002	USA	+		
Khader, 2006	Jordan	+	+	-
Saw, 2006	Singapore	-		
Jones, 2007	USA	-		-
Konstantopoulos, 2008	Greece	+	+	-
Czepita, 2010	Poland	+	+	-
You, 2012	China	+	+	+
Pärssinen, 2014	Finland	+		+
Li, 2015	China	+	+	+
Saxena, 2015	India	+	+	+

and writing ($\beta = -0.044$, $p = 0.002$), and less time watching television ($\beta = 0.043$, $p = 0.0008$).

DISCUSSION

In numerous papers a relationship has been described between reading, writing, or using a computer and the possibility of increased incidence of myopia (Tab. 1) [5–16]. However, as yet a mechanism for myopia development has not been found. It is assumed that the cues for the development of myopia are, among others, natural lag of accommodation and the associated retinal blur during near work [4].

In 2005 Buehren et al. [25] demonstrated that the compression of the cornea by the eyelids during reading may be the cause of myopia. They explained this as the eyelids causing lower and higher order aberrations of the eye. These changes were observed to occur much more often in people with myopia than in emmetropia.

A year later Collins et al. [26] conducted similar research in which they demonstrated that reading, observing through a microscope, and working on a computer have different effects on corneal aberrations. The authors concluded that lid-induced corneal aberrations may lead to more frequent incidence of myopia.

Currently, most authors believe that watching television does not influence the prevalence of myopia (Tab. 1). [6, 7, 9, 17]. This is probably caused by the fact that when watching television our eyes do not accommodate and are aligned in the centre of the palpebral fissure.

Similar to the results of other researchers, we have concluded that reading, writing, or using a computer may lead to an increase in the development of myopia. We did not observe a dependency between watching television and the incidence of myopia.

The results obtained by us are credible because the examinations have been conducted under cycloplegia on a large population. Besides, the study was conducted on a racially homogenous group living in the same climatic conditions. This enables a precise evaluation of the role of reading, writing, using a computer, or watching television in the development of myopia.

CONCLUSIONS

Reading, writing or using a computer may lead to the development of myopia. Watching television has no influence on the incidence of myopia.

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