

# REFRACTIVE ERRORS AMONG CHILDREN AGED 6-15 YEARS PLAYING VIDEO GAMES

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## ABSTRACT

**Background:** A refractive error is an error in the focusing of light by the eye and a frequent reason for reduced visual acuity. The burden of uncorrected refractive errors among our population is large and as effective interventions are available, prompt identification can improve quality of life. **Objective:** To determine association between duration of playing video games and different types of refractive errors among children between age 06 to 15 Years. **Patients and Methods:** In this cross sectional study 100 children (95 Male & 05 Female) were registered and vision of all the subjects were checked using a distance Snellens visual acuity chart. Retinoscopy and subjective refraction were done in the subjects having visual acuity less than 06/12 in one or both eyes. Questions regarding their habits of playing video games along with its duration were asked, with demographic features of each study subject. **Results:** Out of the 100 subjects, 18 were found to have refractive errors, mainly; myopia (72.22%), hyperopia (16.7%) and astigmatism (11.1%). Our study showed no significant relation of refractive error with their habit of playing different types of video games. However, there was significant relation between refractive error and duration of playing video games. **Conclusion:** It is concluded that there is a significant association between refractive errors and duration of playing video games in children, and this relation needs to be further explored on large scale.

**Key words:** Refractive errors, Video games, Visual Acuity

## INTRODUCTION

Globally, about 161 million people are visually impaired.<sup>1</sup> A refractive error is an error in the focussing of light by the eye and a frequent reason for reduced visual acuity.<sup>2</sup> Refractive errors are frequently categorized as spherical and cylindrical errors. Spherical errors occur when the optical power of the eye is either too large or too small to focus light on the retina. People with refractive errors mainly have blurry vision. Most frequent refractive errors are myopia, hyperopia and astigmatism. Emmetropia can be defined as “A state of refraction, wherein, the parallel rays of light coming from infinity are focused on the sensitive layer of retina with accommodation at rest”. Thus, an emmetrope eye will have a clear image of a distant object without an internal adjustment of its optics.<sup>3</sup> Ametropia is defined as “A state of refraction, wherein, the parallel rays of light coming from infinity are focussed either in front or behind the sensitive layer of retina, in one or both meridian.”<sup>4,5</sup>

When the optics are too powerful for the length of the eyeball (this can arise from a cornea with too much curvature or an eyeball that is too long), one has myopia.<sup>4</sup> Myopia or shortsightedness is a type of refractive error in which parallel rays of light coming from infinity are focussed in front of the retina when the accommodation is at rest.<sup>6</sup> When the optics are too weak for the length of the eyeball (this can arise from a cornea with not enough curvature or an eyeball that is too short), one has hyperopia.

Cylindrical errors, occur when the optical power of the eye is too powerful or too weak across one meridian of the optics. It is as if the overall lens tends towards a cylindrical shape along that meridian. People with this refraction error see contours of a particular orientation as blurred, but see contours with orientations at right angles as clear. When one has a cylindrical error, one has astigmatism.<sup>6</sup>

According to World Health Organization, in 2002, more than 161 million people globally were visually impaired, of whom 124 million people had low vision and 37 million were blind. However, refractive error, as a cause of visual impairment was not included, which implies that the actual global magnitude of visual impairment is much greater. Worldwide, for each blind person, an average of 3.4 people have low vision, with country and regional variation ranging from 2.4 to 5.5. The first global estimates since the early 1990s are the best achievable scientific estimates of the global burden of visual impairment and are the result of new studies carried out in nearly all WHO regions, which have

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substantially updated the epidemiological data.<sup>6</sup> Recent studies have confirmed the existence of a large burden of uncorrected refractive errors, although the interventions required are significantly cost effective and have an important impact on economic development and quality of life. Severe refractive errors have been estimated to account for about 5 million blind people. According to the most recent data available to WHO, there are an estimated 124 million people in the world with low vision. About a fourth of these would benefit from low vision services.<sup>7</sup>

Refractive errors can be rectified with appropriate optical correction, while people with low vision may be helped with low vision services. Large number of persons, including schoolchildren, require correction of refractive errors, such as, short sightedness and long sightedness. Vision 2020 partners develop models to provide affordable optical correction and low vision aids to persons in need worldwide, specifically those from poor urban and rural areas with limited available services. The availability of these services helps ensure a better future for visually impaired children and adults.<sup>8</sup>

Jeremy AG et al, say that the amount of time siblings spend engaged in near work tasks (reading, watching TV, playing video games, computing) and in outdoor activities was also highly correlated between siblings ( $p < 0.001$ ).<sup>9</sup>

Heredity was the most important factor associated with juvenile myopia, with smaller independent contributions from near distance work, higher school achievement and less time in sports activity. There was no evidence that children inherit a myopigenic environment or a susceptibility to the effects of near work from their parents.<sup>7</sup> Evidence exists for the correlation of presence of refractive errors with habit of watching television, close study, studying in dim light and playing video games.<sup>10</sup>

Chan WY, Chia KS, Stone RA, Tan D say that children aged 7 to 9 years with a greater reading exposure were more likely to be myopic. This association of reading and myopia in a young age cohort was greater than the strength of the association generally found in older myopic subjects. Whether these results identify an association of early-onset myopia with near work activity or other potentially confounding factors is discussed.<sup>11</sup>

Dr. Hertle wonders about the chicken-or-egg effect or lifestyle factors leading to myopia (or preventing it), or whether myopic youngsters are for some reason drawn to activities that are associated with myopia development, such as frequent reading and computer use. "Someone may be genetically programmed to be myopic or not, and there are certain environmental cues that will generate myopia, including playing video games and reading," he said. "These might be proofs of theory about culture, not the biology of myopia."<sup>12</sup>

In the developed and developing countries, the trend of out door activities has markedly declined mainly due to the increase in the burden of homework, limited out door facilities and the revolutionary development of electronic sources of recreation, like video games, computer game etc. These are easily accessible and attractive for children. These indoor activities affect the general, as well as the mental health of children. The Vision 2020 global initiative of the World Health Organization aims at early recognition of avoidable causes of blindness and visual disability, & their prompt treatment. It has identified uncorrected refractive errors among children as a major area where immediate action is needed. The impact of refractive errors on the individual & on the community cannot be ignored. Refractive errors are the third commonest cause of blindness in Pakistan, after cataract and corneal opacity.<sup>13</sup>

Present study was conducted to determine the association of duration playing video games with different types of refractive errors among children of 6 to 15 years of age.

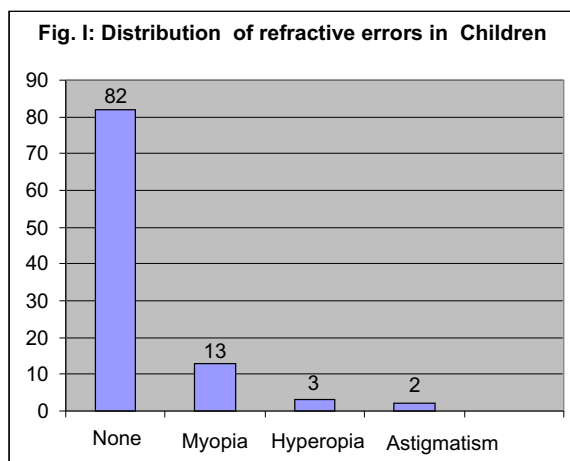
## PATIENTS AND METHODS

This study, was conducted at College of Ophthalmology and Allied Vision Sciences (COAVS), Lahore, from September 2008 to November 2008. Patients were selected from play lands and video game shops of Lahore. 100 children of either sex were registered and vision of all the subjects were checked using a distance Snellens visual acuity chart. Children aged 6 to 15 years who played video games for more than 6 months were included in the study. Children who had not played video games for more than 6 months, were less than 6 years or more than 15 year had visual acuity better than 6/12 or who had any other pathology causing decreased vision, were excluded from the study. Before the start of the research, meetings were held

with the video game shop owners, parents and school teachers. The objectives and the process of research, were explained to them in detail. They assured full cooperation in carrying out research. Retinoscopy and subjective refraction were done in the children having visual acuity less than 6/12 in one or both eyes. Children having refractive errors were prescribed glasses. The data was recorded on the proforma and entered in SPSS 13.0 software. The results were analyzed and tabulated using the same software.

## RESULTS

The data was divided into different sections containing demographic, presentation and association profile. We divided the children into two groups; the first group aged 06 to 10 years (06 %) and second group aged 11 to 15 years 94 (94 %). There were 95 (95 %) males and 5 (5 %) female.

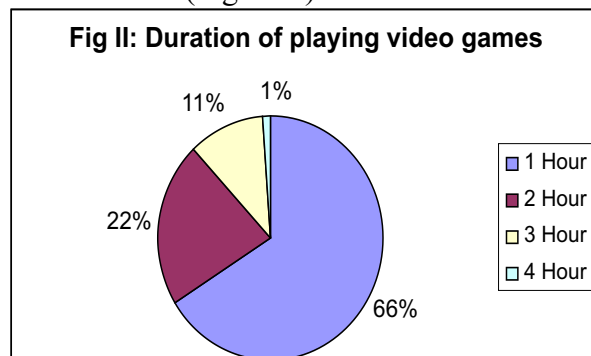


Out of a total of 100 children, 82 (82 %) had no refractive error, 13(13%) had myopia, 3(3%) had hyperopia and 2(2%) had astigmatism (Figure I).

**Table I: Refractive errors versus duration of playing video games**

Duration of playing video games	Types of refractive errors				Total
	None	Myopia	Hyperopia	Astigmatism	
1 hour	62	3	1	0	66
2 hours	11	7	2	2	22
3 hours	8	3	0	0	11
4 hours	1	0	0	0	1
Total	82	13	3	2	100

Out of the 100 children, 66 (66%) children played video games for 1 hour, 22 (22%) played for 2 hours, 11 (11%) played for 3 hours and 1 (1%) played for 4 hours or more. (Figure II)



Of the 66 children who played video games for 1 hour, 62 (93.94%) had no refractive error, 3 (4.55%) had myopia and 1(1.52%) had hyperopia. Out of 22 children who playing video games for 2 hours, 11 (50%) had no refractive error, 7 (31.82%) had myopia, 2 (9.09%) had hyperopia and 2 (9.09%) had astigmatism. Out of 11 children who played video games for 3 hours, 8 (72.72%) had no refractive error and 3(27.27%) had myopia. The only one child who played video games for 4 hours had no refractive error (Table I). These effects of increase in duration of playing video games on development of refractive errors were statistically significant ( $p < 0.05$ ).

## DISCUSSION

In this study, 18 (18%) out of 100 children had a refractive error. We were not able to get many studies for comparison, however, the results of a the study done in our country shows, a prevalence of 19.8% refractive errors in school children.<sup>12</sup>

Studies are pointing towards the fact that the prevalence of refractive errors are now linked to increase in academic levels. As an example, the prevalence of refractive errors has increased over the past decades in Singapore.<sup>5</sup> Myopia was the most common refractive error in our study, followed by hyperopia. Astigmatism was the least common. This relates with all the studies done so far on this subject in school children, which agree that myopia is indeed the commonest refractive error. This is especially true for Far Eastern nations like Hong Kong, Japan etc.

According to one study on madaris students (being related to near work), uncorrected refractive errors were found to be the major cause of low vision in 91% of the students.<sup>8</sup> The prevalence of refractive

errors among children in this study is a measure of the level of awareness of children and their guardians, and reflects the fact that they delay seeking help for visual problems.

In our study, majority (94%) of the students were 11 to 15 years of age. Undetected reduction in vision in this susceptible age group may result in maximum hampering of working ability.

95% of our subjects were males as trend of playing video games is far more common in male children in our community. The study also reveals that the proportion of refractive errors is more in children, who play video games for more than one hour per day 14/18 (77.78%) than in children playing video games for one hour or less 4/18 (22.22%). We also observed that there is no significant association between types of video games and refractive errors.

This study is by no means an exhaustive study owing to lack of time, manpower and other resources. It is basically a cross-sectional survey, carried out to gauge the gravity of the situation. It is intended to serve as a guideline for further extensive studies on a large scale, especially in collaboration with the professionals engaged in Community Ophthalmology Programs.

The results of the study conducted by Ayub A et al, revealed that 107 out of 540 (19.8%) of the children had refractive errors. Myopia was the most common refractive error being 43% (46/107) of the total. Astigmatism, simple as well as mixed/compound, was 35.5% (38/107) while hypermetropia was least common i.e. 21.5% (23/107). Strong correlation was found between a positive family history of refractive errors, watching television closely, studying in dim light, near distance reading and over indulgence in computer or video games.<sup>10</sup>

## CONCLUSION

There is a significant association between refractive errors and duration of playing video games in children. Eye care professionals should investigate the said relation in depth as it may prove helpful in preventing the development and progression of refractive errors in children. This message should be conveyed to parents and guardians as well.

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