

The Biophysical Efficacy of Smart Phones on the Eyes of Children from 3-12 Years

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Abstract

The modern day electronic gadget like laptops, smart phones (which offers advanced Technologies' with functionality similar as a personal computer), TV, computer games that held by hand, ... etc. that completely influence the vision, a books or a newspaper that read is healthier than reading taken away the electronic devices due to the printing materials are typically great in divergence while the electronic screen contentment approach with drop contrast and thus needs further optical focus as well as added strain to the eye. In the current study , we assess the biophysical effectiveness of mobile phone on children up to 12 years, the current study was enrolled fifty (50) children, the information were taken as (age, gender, time of using mobile phone in hours, at which time the child use mobile phone day or night, visual acuity, family history, symptoms). Many optical devices used to obtain precise measurements from the patients which included (Snellen chart, autorefractometer, retinoscope, trial case, E card test, finger cube test, hand card test, catford drum test, Sheridan gardiner test and prism bar).

After conducting the necessary statistical methods and tests, it revealed that the most factor has more effect is the number of hours of using mobile phone devices and the children between (6-8) years were the most used mobile phone devices.

Keywords: *biophysical efficacy; smart phones; eyes of children.*

Introduction

The modern day electronic gadget like laptops, smart phones (which offers advanced technologies with functionality similar as a personal computer), TV, computer games that held by hand, ... etc. that completely influence the vision, a books or a newspaper that read is healthier than reading taken away the electronic devices due to the printing materials are typically great in divergence while the electronic screen contentment approach with drop contrast and thus needs further optical focus as well as added strain to the eye. During working on the smart device, most individuals do not blink their eyes, in addition, they working for long time e.g., many hours incessantly evaporates the drops of tear, then, dryness in the eye such as blurring of vision, eyes painful, , inadequate blinking that causing eyes dryness as well as headaches can result due to the eyes focusing on the smart device screen for longer time interval ^[1].

Video games that held by hand that children played for long time duration without giving break to their eyes, continuously straining the eyes on the small screen of the video games for a longer duration of time can cause trouble, eye irritation with objects focusing at different distances, high or low radiation energy that produce from almost all electronic devices that involve internal part of human such as” brain “screens are below planes that can cause damage of eye such as cataract ^[2]. Using of mobile devices excessively can cause problems of eyes such as myopia condition (short-sightedness) and amblyopia (eye lazy) in children in younger age ^[3].

Rays enter the lens by passing through the pupil then iris then lens, rays pass through the vitreous humor, fovea; the area of visual acuity, that is a measure of the vision clarity, then retina(when the rods and cones) are react to ranges of light upon a great energetic level, in short ranges of light simply just the rods are activated. The inability to differentiate the visible colors at nighttime

is due to the rods inability to discriminate between the colors. A fully adapt to low light is up to 35 minutes as a time taking by the eyes that result in a monochromatic mode called "scotopic vision". While, in brighter light, the active parts are cones, therefore, the adaptation to this trichromatic mode is called "photopic vision", may take up to 10 minutes [4]. The (reading and writing) of video display terminals and learning that using for long hours has been accompanied with a reduction in maximum blink interval, since the symptoms of dry eye are progressing [5][6][7]. After persistent work with video display terminals sustainly, the ocular fatigue was reported by many people [8]. Ordinary cellular phones affect health of human as well as daily life that reported by previous studies, also cellular phone has associates with many problems of health like; disorders of sleep; headaches; leukemia; brain tumors as well as eyes malignant melanoma [9][10]. An association between smart phone using and ocular health have reported by many recent studies, two cases of transient monocular vision loss as a study reported due to smart phone using [11]. The rate and mean of time spending due to smart phones using were higher in a study reporting and including subjects with pediatric dry eye disease (DED) than the non-DED group [12]. When smart phones using excessively, in addition, an increasing in using time of smart phone is related to (DED) these may affect the ocular surface and film of tear. Symptoms of severe ocular as the results of watching visual display terminal (VDT) by office workers who spent more than 4 hours, similarly, symptoms of multiple ocular are associated to the intensive using of smart phone [13]. One of the studies indicated as smart phone screen was emitted the blue light that had adverse effect on the human eyes especially in corneal epithelial cells [14]. At the ocular surface of mice, deterioration of the tear film and induced planes of inflammatory markers and production of reactive oxygen species (ROS) as the results of over exposure to the blue light [15].

Where the parallel rays approaching from the distance, respecting the refraction through the cornea and the lens, myopia as a refractional result anomaly, passing through the vitreous humor and focusing to the retina. Before the focus in divergence state of focusing, they initiate retinal dispersive circles with blurring image of the subject that is placed in infinity [16]. Heredity and environmental factors; endocrine disorders; obesity;

malnutrition, obesity; chemical deficits (calcium, vitamin deficit); excess activities (working conditions) during near-sighted as well as intense or insufficient using of glasses are the main causes of myopia that elaborated by several issues [17] [18].

The blue light can causes the oxidative damage was shown to be inhibited by effective antioxidant extract associated-free radical elimination, hence improving the clinical symptoms of the eye surface in a dry eye mouse model [13]. Also the additional established that the formation of dry eye is associated with the blue eye.

Aim of Study

to evaluate the biophysical effect of mobile phones on the eyes during working a longtime front of the mobile phones.

Patients and Methods

The study was attended in the Ghazy Al-hariri hospital, Al-Yarmouk hospital and from learning clinic for optical techniques department. The study includes fifty subjects in order to assess the biophysical effect of mobile phones on children up to 12 years. The data were collected from the patients themselves and their files, the patients were examined by using Snellen chart to detect the visual acuity and by retinoscopy and autorefractometer to detect the type of refractive error and its degree measurement.

Snellen chart: Used to examine the visual acuity of both patient's eyes .so **Autorefractometer :** Used to measurement of refractive error and the curvature of the cornea. and **Retinoscope** Used to examine the refraction of the eye for prescription evaluation. **Trial case :**Used to corrective for any type of the refractive error in the eye. **E test:** The E's may be printed on cards or on the sides of a cube the child may be asked to communicate his answer by pointing his flingers in the direction of the limbs of the E or by holding up a wooden E to correspond with the test E [33]. **Hand test:** using cards which is held up with the fingers open, it is a good method where we can examine very small children & they co- operate with us, if it used as a game [33]. **Finger cube test:** using cubes with different sizes of finger picture. **Sheridan-Gardiner test:** this uses the principle of matching letters, the child is given a card with seven letters printed on it and another card is held up at the standard distance

with one letter printed on it and the child is asked to point to the corresponding one on his card [33]. **Catford drum test:** is a rotational device to vision test, since the individuals are accommodated facing the drum wall, the internal apparent surface of the drum is typically striped, as the drum rotates, the eyes of subject are submit to a movable vision field , since the subject rests stationary,

this phenomenon is called optokinetic nystagmus, test duration and drum speed may be varied, after exposure to the rotating drum, subjects are surveyed to regulate their susceptibility to motion sickness[34]. **Prism bar:** used with cover-uncover test to determine the angle of deviation of squint.

Finding

In the current study, a total 50 patients included 25 males and 25 females, the smaller age of group in the samples was between (3-5) years in percentage 30%, (6-8) years in percentage 40% and more than 8 up to 12 years in percentage 30%.as the in table.

Table (1): The relation between age(years) & gender.

Items			Gender		Total
			Male	Female	
Age	3-5	Count % within Gender	7 28.0%	8 32.0%	15 30.0%
	6-8	Count % within Gender	11 44.0%	9 36.0%	20 40.0%
	more than 8 up to 12	Count % within Gender	7 28.0%	8 32.0%	15 30.0%
Total		Count % within Gender	25 100.0%	25 100.0%	50 100.0%

In the table (2), it was found that 68.4% who use mobile phone for (1-3)hours daily was between age (3-5)years while those who use mobile phone more than 7 hours daily in that age was 0 percent, 55% who use mobile phone for (4-6) hours daily was between age (6-8) years and 54.5% who use mobile phone for more than 7 hours daily was more than 8 up to 10 years age.

Table (2): The relation between age(years) & time of using mobile phone.

Items	Time of using mobile phone			Total
	1-3 hour	4-6 hour	>7 hours	
A 3-5 g e Count	13	2	0	15
% within time of using mobile phone	68.4%	10.0%	.0%	30.0%
6-8 Count	4	11	5	20
% within time of using mobile phone	21.1%	55.0%	45.5%	40.0%
more than 8up to 12 Count	2	7	6	15
% within time of using mobile phone	10.5%	35.0%	54.5%	30.0%
Total Count	19	20	11	50
% within time of using mobile phone	100.0%	100.0%	100.0%	100.0%

It was observed that who use mobile phone at day time their percentage was 61.9% in the age between (3-5) years while 19% was in the age between (6-8)years and also for the age more than 8 up to 10 years, This means that as the children’s age increase they become using mobile phone more time during the day and night, table (3).

Table (3): The relation between age(years) & interval of using mobile phone.

Items	Interval of using mobile phone			Total
	Night	Day	Both	
Age 3-5 Count	0	13	2	15
% within interval of using mobile phone	.0%	61.9%	7.1%	30.0%
6-8 Count	0	4	16	20
% within interval of using mobile phone	.0%	19.0%	57.1%	40.0%
more than 8 up to 12 Count	1	4	10	15
% within interval of using mobile phone	100.0%	19.0%	35.7%	30.0%
Total Count	1	21	28	50

Table (4) : The relation between age(years) & V.A without glasses.

Age(years)	V.A (R or L)					
	6/6-6/12		6/18-6/36		less than 6/60	
	Right	Left	Right	Left	Right	Left
3-5	12	11	2	3	1	1
% within V.A (R or L)	36.4%	40.7%	16.7%	15.8%	20.0%	25.0%
6-8	12	10	5	8	3	2
% within V.A (R or L)	36.4%	37.0%	41.7%	42.1%	60.0%	50.0%
More than 8 up to 10	9	6	5	8	1	1

Cont... Table (4) : The relation between age(years) & V.A without glasses.

% within V.A (R or L)	27.3%	22.2%	41.7%	42.1%	20.0%	25.0%
total	33	27	12	19	5	4
% within V.A (R or L)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

In table (4), it was found that most of the samples between (3-5)years have visual acuity without glasses (6/6-6/12) for R.E. 12 samples in percentage (36.4%) and for L.E. 11 samples in percentage (40.7%) , most of the (6-8) years age have visual acuity without glasses (6/6-6/12) for R.E. 12 samples in percentage 36.4% .

This means that most of children’s have visual acuity within the range between (6/6-6/36) and only 5 cases have V.A less than 6/60 for the right eye and 4 cases for the left eye.

Table (5): The relation between age(years) & V. A With glasses.

Items	V.A (R or L)					
	6/6-6/12		6/18-6/36		less than 6/60	
	Right	Left	Right	Left	Right	Left
3-5	14	14	1	1	0	0
% within V.A (R or L)	30.4%	30.4%	25.0%	25.0%	0%	0%
6-8	18	18	2	2	0	0
% within V.A (R or L)	39.1%	39.1%	50.0%	50.0%	0%	0%
More than 8 up to 12	14	14	1	1	0	0
% within V.A (R or L)	30.4%	30.4%	25.0%	25.0%	0%	0%
total	46	46	4	4	0	0
% within V.A (R or L)	100.0%	100.0%	100.0%	100.0%	0%	0%

It was found that most of the samples between (3-5) years age have visual acuity with glasses (6/6-6/12) for R.E. 14 samples in percentage 30.4% and also for L.E., most of the (6-8)years age have visual acuity with glasses

(6/6-6/12) for R.E. 18 samples in percentage 39.1% and also for L.E. , and more than 8 up to 12 years age have visual acuity with glasses (6/6-6/12) for R.E. 14 samples in percentage 30.4% and also for L.E. , it was observed

that samples with less than 6/60 are (0) while there was in total 5 samples for R.E. and 4 samples for L.E. in cases of without glasses, table (5). That is means that all the children with V.A less than 6/60 and some with V.A (6/18-6/36) their vision have corrected with eye glasses.

Conclusion

We conclude that most of children play smart mobile phone devices between age (6-8) years and the most of the children use mobile phone at the day and night time between age (6-8) years, as well as most of the children have visual acuity (6/6-6/12) for both eyes in cases of with glasses and without glasses.

Conflict of Interest: non

Source of Findings: self-findings.

Ethical Clearance: This research was carried out with the patient's verbal and hospital approval before the cases was taken.

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