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# The Effect of the Electronic Devices on Children

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**Abstract.** The use of technology in the classroom and home for different purposes is becoming more prominent every day. It has enabled the teachers and parents to pass more information in a shorter time than it was traditionally possible. Nowadays, children are using smart phones and handheld devices more frequently. This has raised a concern about the effect of these devices on children health and life. This paper studies the relationship between the scientific levels of a group of students in a school age according to the number of hours of use of electronic devices by those students.

## 1. Introduction

A world-wide employment of smart phones and a little knowledge about their side effects encouraged many authors to start research on effect of electronic devices on children health and life.

Many researchers have studied that children spend average of their time on different gadgets like telephone, radio, TV, games, Xbox, iPod and stereo system [1]. Kids use gadgets for various purposes like playing games, watching videos, listening songs, chatting with their friends, browsing different websites. They spend most of their time in these activities and don't pay attention to their posture, screen brightness, and screen distance from their eyes which ultimately affect their vision and health.

The development of mobile communications has moved rapidly. In the 1980s, first generation mobile phones, using analogue technology, allowed the transmission of sound only. Digital transmission, and the global system for mobile communication, started in 1991 and include such new developments as data and image transmission. Third generation mobile phones currently in the market offer additional services to the users (such as fax, e-mail and Internet access). For both analogue and digital mobile phones, the signals transmitted and received are in the form of waves in the radio frequency (RF) (analogue) and microwave parts of the electromagnetic spectrum. RFs are non-ionizing radiation with, wavelengths that range from 3 kHz to 300 MHz, and microwaves range from 300 MHz to 300 GHz. The frequencies that mobile phones and telecommunication networks use range from 900 MHz to 1.8 GHz and up to 2.1 GHz, although it should be noted that the wavelength of the different types of mobile phones [2].

Children who spend more time with media devices reportedly have lower levels of personal contentment and have a tendency to get in trouble more often. They also report feeling more sad or bored than their counterparts [3].



## 2. Theory

Electromagnetic waves are produced by the motion of electrically charged particles. These waves are also called electromagnetic radiation because they radiate from the electrically charged particles. They travel through empty space as well as through air and other substances. Electromagnetic waves at low frequencies are referred to as electromagnetic fields and those at very high frequencies are called electromagnetic radiations as shown in Fig.1 [4].

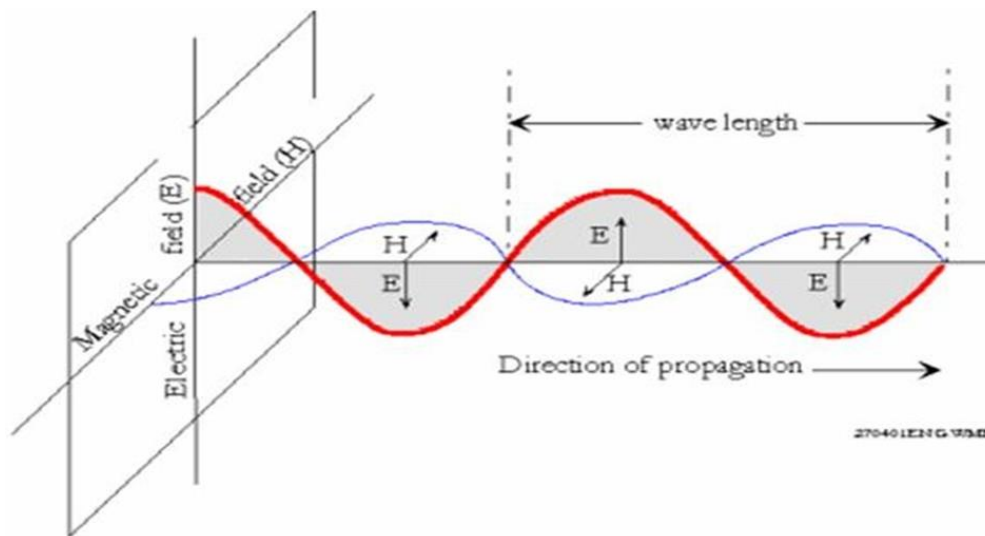


Fig.1. Magnetic field and electrical field in electromagnetic wave

Electromagnetic radiation propagates in the vacuum at a constant velocity, which is the velocity of emptiness in space.

Radiation and fields can be divided into discrete bands having different interactions on living organisms: ultraviolet radiation, visible light, infra-red radiation, microwaves, radiofrequency fields and low frequency fields [5]. The examples of non-ionizing EMR are divided into frequency ( $f$ ) bands, namely: radio frequency (RF) ( $100 \text{ kHz} < f \leq 300 \text{ GHz}$ ), intermediate frequency (IF) ( $300 \text{ Hz} < f \leq 100 \text{ kHz}$ ), extremely low frequency (ELF) ( $0 < f \leq 300 \text{ Hz}$ ), and static ( $0 \text{ Hz}$ ) (only static magnetic fields are considered in this opinion) [6].

Electromagnetic waves generated by many natural and human-made sources can travel for long distances and play a very important role in daily life. In particular, the electromagnetic fields in the Radiofrequency (RF) zone are used in communications, radio and television broadcasting, cellular networks and indoor wireless systems. Resulting from the technological innovations, the use of electromagnetic fields gradually increases and thus people are exposed to electromagnetic waves at levels much higher than those present in the nature [7, 8]. Along with the widespread use of technological products in daily life, the biological effects of electromagnetic waves started to be discussed. Particularly, the dramatically increasing number of mobile phones users rise significant concerns due to its potential damage on people exposed by radiofrequency waves. Since mobile phones are used in positions very close to the human body and require a large number of station antennas, the public and the scientists have question marks in their mind about the impact of mobile phone networks on health [9].

While the positive aspect of technologic innovation makes the life easier, it may also involve components that impair the quality of life via its certain negative effects. A discussion about the adverse effects of electromagnetic waves on the biological life has been continuous since the discovery of electricity in the 19th century [10].

### 2.1. Effect of electromagnetic waves on human brains

According to the National Radiological Protection Board summary report, most of the 26 reports examined reached similar conclusions and made comparable recommendations. Overall, the reports acknowledge that exposure to low-level RF and microwave fields may cause a variety of slight biological effects on cells, animals or people, particularly on brain activity during sleep, but the possibility of exposure causing adverse effects on health remains unproven. The reports also present guidance on public policy to decision-makers and legislators, and some of them favor any form of precautionary or prudent approach to reducing personal exposure to the fields produced by mobile phones. [11].

The most recent review by Khurana et al. investigated the relationship of wireless phone use for more than 10 years with a risk of brain tumor. This review covering a total of 11 metaanalyses showed that the brain tumors, namely glioma and acoustic neuroma increased 2-fold in people using wireless phones for more than 10 years, achieving a statistical significance [12].

Reham et al. [13] (In 2015) have studied male children are more affected from EMR pollution than female children, except for systolic blood pressure where female children are more affected. This result is due to that the males body contains electromagnetic waves more than a females body [14]) and the monthly period for females [15]. The highest value of EMR is  $1862\mu\text{W}/\text{m}^2$  and lowest value is  $18.28\mu\text{W}/\text{m}^2$ .

### 3. Results and Discussion

The samples of this study are 82 students of both genders (66 female, 16 male), distributed in two different schools in Fallujah are Al Nakheel primary school and Al Madina- Elmonawara primary school as shown Fig. 2. The samples ages were between 11-12 years.

This age was chosen for this study due to the increase use of electronic devices. The questions chosen were:

1. How frequently and how long do you use smart phone or handheld device (HHD)?

All respondents use hand held device from zero to maximum six hours per day.

2. Have you experienced any eye tension or insomnia after using smartphones/HHD?

Some students have symptoms of insomnia and some of them experience eye tension after using HHD longer than two hours.

3. Do the students have any difficulties in math and science?

It has been confirmed that the students who uses the HHD longer than five hours have noticeable difficulties in math and science. The Fig.2 shows data collection from of the palm primary school and the effect of using smart devices on the scientific level of the students.

Fig. 3 shows that decreases of scientific level for students which 11-12 years due to the more using for devices electronic. The results for students which have not electronic devices were better than the results for students which electronic devices. The results also showed that electronic devices affect the level of science on girls more than boys. There were no signs about the effect of electronic devices on children's health. Specifically, most reports recommend limiting the use of mobile phones by children. This has been recommended in the absence of explicit scientific data. However, ethical and practical concerns limit or prevent experimental studies on children.



Fig.2. Data collection from of the palm primary school.

Because of a much higher cumulative exposure than today's adults when they were at the same age, children might be more vulnerable to any effects of RF and microwave radiation. As long as adverse effects on health cannot be ruled out with some degree of certainty, it appears to be appropriate to instruct children and their parents about a prudent use of mobile phones. Moreover, in the absence of new scientific evidence, WHO is focusing attention on the potential effects of exposure to electromagnetic fields on children [16]. Finally, many reports agree that the distraction caused by mobile phone use while driving represents a serious threat to health.

#### 4. Conclusions

Although electronic devices and the development in communications makes the life easier, it may also involve negative effects. Along with the widespread use of technological products in daily life, the biological effects of electromagnetic waves have begun to be more widely.

The study showed that there is an effect on electronic devices at the scientific level of students. With increasing hours of use of electronic devices as decreases the scientific level of students (male and female). We have not seen any health effect on the use of electronic devices at the moment because the study was only on the scientific level of students. Explaining the results of the electronics devices risks on children health from the teachers of the schools.

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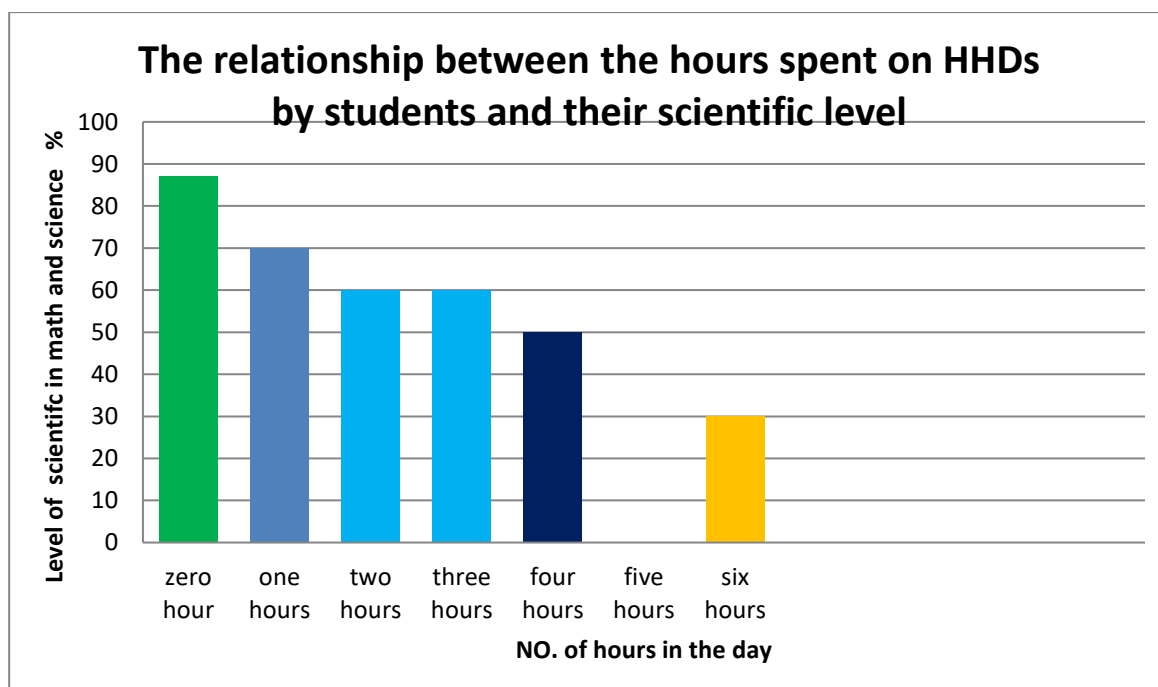


Fig.3. the relation between number of hour which students siting on device electronic and the level scientific them