

# The Fundamental Reasons Why Laptop Computers should not be Used on Your Lap

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## ABSTRACT

As a tendency to use new technologies, gadgets such as laptop computers are becoming more popular among students, teachers, businessmen and office workers. Today laptops are a great tool for education and learning, work and personal multimedia. Millions of men, especially those in the reproductive age, are frequently using their laptop computers on the lap (thigh). Over the past several years, our lab has focused on the health effects of exposure to different sources of electromagnetic fields such as cellular phones, mobile base stations, mobile phone jammers, laptop computers, radars, dentistry cavitrons and Magnetic Resonance Imaging (MRI). Our own studies as well as the studies performed by other researchers indicate that using laptop computers on the lap adversely affects the male reproductive health. When it is placed on the lap, not only the heat from a laptop computer can warm men's scrotums, the electromagnetic fields generated by laptop's internal electronic circuits as well as the Wi-Fi Radiofrequency radiation hazards (in a Wi-Fi connected laptop) may decrease sperm quality. Furthermore, due to poor working posture, laptops should not be used on the lap for long hours.

## Keywords

Laptop Computers, Safety, Electromagnetic Fields, Heat, Posture

## Introduction

Laptop computers are popular all over the world as they are lightweight and portable. Rapid technological advances in terms of memory space and processor speed have made laptop computers more popular among students. It has been reported that genetic and pathological factors and exposure to organic pollutants and endocrine disrupters are associated with male infertility [1-3]. Furthermore, other researchers and our team have previously shown that semen quality might be linked to exposure to electromagnetic fields [4-9]. Over the past several years, our lab at the Ionizing and Non-ionizing Radiation Protection Research Center (INIRPRC) has performed extensive experi-

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ments on the health effects of exposure of animal models and humans to different sources of electromagnetic fields such as cellular phones [10-17], mobile base stations [18], mobile phone jammers [19], laptop computers [7], radars [11], dentistry cavitrons [20] and MRI

[21, 22]. To evaluate the pattern of laptop use in male students, we conducted a preliminary study in July 2015. The demographic and laptop use data of the university students participated in this study (N = 50) are indicated in Table 1. The findings of this study showed that

**Table 1:** The demographic and laptop use data of the male university students participated in this study (N = 50).

	Frequency (%)	Mean± SD (Range)
<b>Age (years)</b>		25.36±1.66 (21-29)
<b>Major</b>		
Medicine	18 (36%)	
Dentistry	7 (14%)	
Pharmacy	8 (16%)	
Postgraduate-Master	16 (32%)	
Postgraduate-Ph.D	1 (2%)	
<b>Laptop Use</b>		
Yes	44 (88%)	
No	6 (12%)	
<b>Daily Laptop Use Time</b>		3.08±1.52
< 2 hours	7 (14%)	
2-4 hours	35 (70%)	
> 4 hours	8 (16%)	
<b>"On Lap" Use Time</b>		
< 1 hours	33 (66%)	
1-2 hours	16 (32%)	
> 2 hours	1 (2%)	
<b>"Wi-Fi on" Time</b>		
≤ 1 hours	11 (22%)	
2-3 hours	30 (60%)	
> 3 hours	9 (18%)	
<b>"Heat Sensation" on the Lap during laptop usage</b>		
Yes	3 (6%)	
1-2 hours	47 (94%)	

88% of the male students had used laptop computers. The mean ( $\pm$ SD) of daily laptop computer use was  $3.08 \pm 1.52$  hours. On the other hand the mean ( $\pm$ SD) “on lap” use time was  $0.48 \pm 0.76$  hours. Interestingly, 32% of the students had used their laptops for 1-2 hours per day. The demographic and laptop use data of the male university students participated in this study (N = 50) are indicated in Table 1.

### Heat

As the name implies, a number of people use laptop computers frequently on their laps. Laptop computers are known sources of electromagnetic field. On the other hand, placing laptop computers on the lap along with many factors such as hot baths and saunas increases the scrotum’s temperature. Substantial evidence indicates that elevated scrotal temperatures might be linked to male infertility. To date, there are only limited reports on increase in scrotal temperature in laptop computer users [23]. Sheynkin et al. in 2005 evaluated the scrotal temperature in 29 healthy volunteers in two separate 60 min sessions. Their experiment showed that using laptop computer in a laptop position causes significant scrotal temperature elevation due to heat exposure and posture-related effects [23].

### Wi-Fi Radiofrequency radiation hazards

Avendaño et al. in their paper entitled “Use of laptop computers connected to internet through Wi-Fi decreases human sperm motility and increases sperm DNA fragmentation”, that was published in the January 2012 issue of Fertility and Sterility [24] addressed the detrimental effects of exposure of sperms to Wi-Fi radiation. They reported that to their knowl-

edge, their study was the first study to evaluate the direct impact of laptop use on human spermatozoa. Although their study seems to be the first experiment on human sperm, Mortazavi et al. published a report on the same topic in an animal model. This report was published in “Journal of Reproduction & Infertility” in July 2010 [25].

### Shortcomings of previous papers

The paper published by Avendaño et al. has some severe methodological flaws. Authors have divided each sperm suspension into two aliquots. One sperm aliquot (experimental) from each patient was exposed to an internet-connected laptop by Wi-Fi for 4 hours, whereas the second aliquot (unexposed) was used as control, incubated under identical conditions without being exposed to the laptop. The authors did not pay attention to this fact that the electromagnetic fields (EMFs) generated by laptop (without any Wi-Fi connection) may play a basic role in reducing the sperm motility. This is exactly what we have reported in 2010 [25]. In our experiment, animals in the test groups were kept on the marked areas on a thermal shield placed on the back of an inverted laptop 7 hours a day for one week. The controls were kept on a switched off laptop for the same period. Our study showed a significant decrease in sperm motility in areas with a relatively stronger magnetic field. We could not observe any significant change in sperm count.

On the other hand Avendaño et al. did not notice that RF fields in Wi-Fi band varies at different distances from the Wi-Fi client card in a laptop during uploading and downloading “*The user of a laptop would be exposed to stronger fields than reported here, particularly if the antenna in the client card were close to*

the user's body" [26]. In this regard Avendaño et al. should have clearly reported the RF level in any point they placed the sperm samples. Due to shortcomings of the study performed by Avendaño et al. in our recent study [16], we directly investigated the bioeffects of exposure to electromagnetic fields generated by common Wi-Fi routers on human sperm quality.

### Poor working posture

The portability of laptops has led to this great advantage that can be used in a wider variety of environments compared to desk-top computers. Therefore, some people use laptops for long hours. As placing a laptop on the lap may induce poor working posture, long time usage should generally be avoided.

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### Conflict of Interest

None Declared.

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