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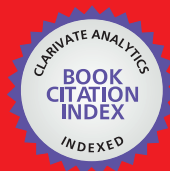
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# Where Is the Smartphone Leading the Health of Children?

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## Abstract

Smartphones allow users to carry a mobile phone, games console, music player, camera, calendar, and Internet browser all in one small handheld device, with their limitations governed only by the types of applications downloaded onto them. They have become an indispensable part of the daily life. While smartphones have made life more convenient with their advantages, they have also brought many side effects especially on the health. This chapter crosses literature data on the side effects of smartphone in terms of health, especially in children. Nonetheless, it may affect people's psychology, behavior, and health especially those of children. A mobile phone battery when heated explodes as a bomb. Awareness should be raised on the dangers of smartphones for children as telephone has become a real life partner in everything. Telephony companies as well as parents should join their effort, and measures should be taken to protect children and teenagers to ensure their welfare as they use smartphones. It is not enough to say that the humanity is in permanent danger. It is necessary to prioritize the protection of health while we rejoice in these technological advances.

**Keywords:** smartphone, health, insecurity, trauma, children

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## 1. Introduction

A smartphone is a category of mobile device that provides advanced capabilities software system that provides a standardized interface and platform for application developers. They allow users to carry a mobile phone, games console, music player, camera, and calendar and

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Internet browser all in one small handheld device, with their limitations governed only by the types of applications downloaded onto them [1]. There are over 1.5 billion smartphone users around the world, and it was estimated that more than one billion smartphones will be sold in 2016 [2]. Smartphones have become an indispensable part of the daily life. While smartphones have made life more convenient with their advantages [3–5], they have also brought many side effects [2, 6] especially on the health. This chapter aims to focus on the benefaction and disadvantages of smartphone on the health.

This study concerns children less than 15 years of both sexes. We cross literature data on the side effects of smartphone in terms of health, especially in children. Genesis of smartphone, advantages of smartphones, and potential danger of their mismanagement, measures to limit smartphones' dangers would be studied. We will focus on differences between developed and developing countries.

## **2. Genesis of smartphone**

A smartphone is a mobile phone that includes functions similar to those found on personal computers. They provide a one-stop solution for information management, mobile calls, emails sending, and Internet access [7].

It is of the large family of mobile phones and slightly larger than standard mobile telephones.

Mobile phone came into being by the end of 1940s with very limited functions. The very first mobile phone was heavy due to its size and is very expensive. Not everybody could afford it. There was no easy access to mobile phones and very few people could use them. Even if that phone was mobile, it was not easy to carry everywhere, and therefore it was used only in cars and some specific places. However, in 1982, the mobile phone of the first generation (1G) was created in the United States of America by the Bell Laboratories. It was a device with analogue voice. About a decade later, the mobile phone evolves to the second generation (2G). It became smaller, lighter, and cheaper. It functions on a Global System for Mobile Communication (GSM). Many people could afford a cellular then. It helped reducing the price of lines and promoted their integration into the business world since many conversations could be made simultaneously on a single channel. Communication became progressively easier and less expensive [8].

## **3. Advantages of smartphones**

### **3.1. Mobile phone purchased for prestige and power**

However, in the developing and underdeveloped countries, it was almost impossible to afford a mobile phone and only some highly positioned people could. It was something of prestige and luxury in those countries. Many of those who acquired mobile telephones would not buy it because they needed it for business purposes. It was just to show their purchasing

power and their own level of riches. Many were suspicious vis-a-vis mobile phones. They had never seen it before and could not figure out its utility. Some even thought it was a trick from the white to control Africans. It took Africans quite a long time to get into the rhythm of the globalization of technology.

Making and receiving calls everywhere and at any time thanks to cell phones addressed some difficulties related to communication. Therefore, business started doing better for the difficulties are being suppressed progressively. Technology on the whole is evolving to a level that it has never reached before. Computers and network use are widespread; local area network (LAN) and wide area network (WAN) connections connected to desktops and laptops were set. Men and women who enjoy all the technology advancement would not content to these services and would want more. Everything is moving at a dazzling speed.

Science helped human beings to destroy the world at the time of WWI and WWII. Technology has come to help them rebuild it, so there is no way to waste time, it is now or never. Therefore, companies would address needs for data transmission (multimedia), leading to what is known as the third generation (3G) mobile phones with the development of the Universal Mobile Telecommunication System (UMTS). They are multitasks and are programmed to do things in a human way and even more.

Telephones would incorporate Internet connection helping the transmission of files. Reports and letters of meeting in companies can be sent through smartphones. Someone on a mission does no longer need to wait till the end of the mission before submitting the reports, minutes, or whatever administrative writings. Files can be sent to and fro everywhere in limitless time thanks to smartphones. What can't the world do with a mobile phone now?

It is wonderful to notice the extent the world has come to when only a century and a half ago, a man could hardly imagine a world of this kind. Some centuries ago, human beings could not even communicate to their fellows at a mile away if one does not go to them. But today, thanks to smartphones, not only could we communicate with people at millions of miles away but we can also talk to them, feel every single of their breathing, and even see them and their immediate environment instantly as well. Photos, video camera, and games are among the services the smartphones offer.

Technology and science are offering comfort and simplifying the toils in life. Decisions can be made based on data release online. Meetings, conferences, and appointments are held at a distance simultaneously with many people in different places, countries, and on other continents thanks to the applications on smartphones.

Smartphones have upset down the world socially, politically, and even financially [9].

### **3.2. Smartphones at the core of the social life**

Socially speaking, smartphones have become a socializing mean, physical meetings are no longer indispensable, unless for major cases. There is no necessity for young people to go to cyber café to connect to social networks, Facebook, Twitter, WhatsApp, to name but a few. Smartphones are equipped with WIFI apps to connect to local area network (LAN) and wide

area network (WAN). Journalists can report at real-time events from the other end of the planet with photos or videos for evidences. The power of the press has increased thanks to smartphones that make photos, shoot videos in secret without the police or the governments' authorities censoring them.

Besides, anybody at all can send information with his/her smartphone online. Therefore, fewer secrets are being held and people are informed and they can mobilize for or against things they like or dislike. The very example of Tunisia and Egypt during the Arab Spring is an illustration [9].

Also, do smartphones help consolidate democracy in developed countries and contribute to build democracy in developing countries. For example, if the police is used to brutalize or prevent people from demonstrating pacifically by beating or firing on the crowd, those in the crowd who have smartphones can shoot video or take picture and share on social networks instantly, then journalists will relay the information on televisions, radios, and so on. This has helped reduce violence on the population in countries where the heads of states are cold-blood dictators.

When the war in Syria started, the government would forbid journalists to tell the truth on what was going on. However, some independent journalists could report the killings perpetrated on the population on social networks anonymously, and this, thanks to their smartphones. Facing all these forces that smartphones offer, they are being needed and used more often.

Therefore, a ruthless war has exploded among telephony companies. Apple, Samsung, Microsoft, and new Chinese companies are fighting to offer a smartphone of the latest generation to their consumers, a strategic tool for the whole world in integrating applications that were used for laptops and desktops before. Moreover, they are struggling to make smartphone tools in every domain of human activities according to the demand.

**Table 1** presents a list of some services or applications integrated to smartphones.

Medically, further studies and experimentations are being conducted to associate smartphones to remotely monitor outpatients with incisional wounds and collect postoperative symptom information [10]. Patients can take digital photos with their smartphones and send them to caregivers who are located far away. Likewise, they can also give information on their postoperative symptoms via smartphones. This practice of medicine is known as telemedicine and is expanding nowadays. Telemedicine is remote diagnosis and treatment of various health problems. Therefore, making a follow up of non-hospitalized patients.

Farming robots are lastly created and equipped with a device to send a text message to the farmer after the robot finishes the work bestowed on it. This example shows that smartphones have brought a real revolution in the world and to its every single aspect. Smartphones are no longer tools for bureaucrats only but even on the field where land is cultivated.

Smartphone offers leisure and helps people who get bored during their spare times. Not only do video games, TV channels, radio stations incorporated in it occupy people, but

Applications/services	Description
General	Calculators, alarms, notepads, diaries
Geolocations	Identification and position of devices (ships, stars). GPS techniques are used There is a legal vacuum regarding individuals, so this service has not seen great development.
Sports	Allow real-time values associated with sporting activities (walking, running, and swimming) to be recorded, such as heart rate. Recommends the training to be followed, route exercises.
Medicine	World maps with information on informational epidemic in real time. Application for the control of blood alcohol levels, telerehabilitations, stimulation for disabled people, and control of medicine
Leisure	Search engines for leisure and event venues, music players, videos, films, access to televisions and radio channels, and games
Business	Presentations and video conferences, remote access to applications, online and offline statistics, maps of geographical results, markets analysis, inventory access, presentations of products to clients, and launchings of market campaigns. Direct-to-bill mobile payments, avoiding the used of credit cards for Internet transactions
Social	News of general nature, magazines or newspapers, access to social networks (Twitter, Facebook), and messaging [WhatsApp, Spotbros]
Cloud	Access to files stored in the clouds
Education	Courses, language cooking, translators, books (novels, child education, media, university), and virtual universities

**Table 1.** Summary of services or applications integrated to smartphones.

smart phones can also help to locate places and venues of events through engine researcher. The advantages that technology is offering to mankind nowadays are unfolding. Things are moving so fast. Many tasks of a man are being suppressed and replaced by technology. We can hardly think of life without technology today to the extent that it seems as if technology can substitute human beings in all their tasks. It is not imaginable to see somebody without telephone for 24 hours today. Telephones are at the core of life and we cannot do without them, not even for a single day. We have got used to their use that we hardly have time to think of the eventual dangers that could occur from them or to think of the negative impact they can generate on a person and the question is: "What are the limits of smartphones?"

#### 4. Behavioral impacts of smartphones

Researches and studies have shown that the extensive use of smartphones can affect people's behavior. Thus, according to Lepp, Barkley, and Karpinski, there is a negative correlation between cell phone use and academic performance [11]. They came out with a possible explanation stipulating that the time spent on the phone or smartphone is missing in academic endeavors.

Besides, students craving for smartphones or cell phones happen to be multitasking [12]. Multitasking robs working memory' capacity on the one hand, and on the other hand, when responding to emotionally gratifying distracters a task is approached in a more superficial way and it takes longer.

Moreover, empiric experiences showed that some people, especially young people, could no more depart from their telephones; not even for a second. They have become addicted to their telephones and probably for having pornographies on them or for entertaining some relationships like making love online, connecting to other people all around the world on social networks or whatever. It takes them the whole day and the whole night. Some can even hardly sleep, eat, or do their assignments as they are students. Therefore, for passing sleepless nights and for not eating, people with excessive and abusive use of smartphones happen to become sick and thin. Moreover, smartphone can reveal to be a source of corporal danger as well.

#### 4.1. A smartphone, a potential cause of crash?

According to the article, "The real reason you're told you put your mobile in flight mode" published on the website Travel Truths, "Some more begrudgingly than others – as their signals interferes with navigation instruments, and could even cause a crash." One thing that is true in this is that any smartphone or a mobile phone has flight-mode application.

In this article, Patrick Smith, a pilot and the author of Cockpit Confidential, answered "yes" to the assumption that smartphone can cause a crash although he added to his answer "technically" and "but it's more an exercise of caution."

He said: "Aircraft electronics are designed and shielded with interference in mind." This statement, though, it mitigates the fear of air crash related to the use of mobile phone on flights, confirms albeit the assumption of a smartphone being a source of explosion to cause fire. He even clearly added that cellular communication can disrupt cockpit equipment but in all likelihood no.

Moreover, France 24 reported on its website that Samsung Galaxy Note 7 was added to no-fly list of some flight companies and the Federal Aviation Agency called on travelers not to fly with this smartphone that is potentially explosive.

Many incidents, a total of 35, were reported relating to the explosion of the said telephone. On September 10, 2016, the phone exploded as a kid was watching a video on it [13]. He was seriously burned and was taken to the hospital; he was afraid since then to touch a smartphone. On September 05, 2016, the explosion of another Samsung Galaxy Note 7 caused damages of an amount of Australian \$1800 in a hotel in Australia [14]. The company accepted to refund the amount of money to the hotel. As we said before, there were 35 incidents related to the explosion caused by the Samsung Smartphone.

Samsung Galaxy Note 7 explosion reported by France 24 is not the only incident related to mobile explosion in general.

In Togo, Simlawo et al. reported a case on accident caused by a mobile phone [15]: **"Evisceration caused by the explosion of mobile phone battery: A rare form of domestic accident in a child"**

A 7-year-old child in a second grade was admitted to the Emergency Room of the Regional Hospital Center (RHC) of Lomé Commune for abdominal open trauma with bowel evisceration

due to a domestic accident. The child was playing outside the house as the garbage was burning from about 5 m distant. Accidentally, there was an explosion of a mobile phone battery out of the burning garbage. The exploding battery hit the child on the left flank, which led to an abdominal open trauma with bowel evisceration. The bowels could be seen at about 50 cm in evisceration (**Figure 1**). The evisceration was made by an abdominal injury located on the left flank with bruised sides and oval of about 5 cm from the large axle. The injury was not hemorrhagic. The other part of the abdomen had no specific problem. The agent that caused the trauma was brought to the hospital. It was a cubic metallic ball of 5 cm long and 3 cm thick. It was the battery of a mobile phone that exploded while it became overheated. **Figure 2** shows the battery and its exploded portion.

Mobile phones in general use batteries made of lithium ion that is potentially explosive. In the developing countries, there is no particular policy of recycling that can help get rid of these batteries. Although mobile phones are very useful nowadays and almost every household possess one, the management of their damaged batteries must comply with physico-chemical rules. It is also necessary to make a rational and strict management of household wastes in general and in particular, to recycle the mobile phone batteries that are out of use.

#### 4.2. Lack of information on the dangerous aspect of smartphones

Many at times, notice is given on how to use smartphones but hardly a warning is given on the potential danger that can result from a mobile phone. Surprisingly, parents are unaware of dangers faced by children on smartphones [16].



**Figure 1.** Evisceration of the small intestine on the left edge.





**Figure 2.** The mobile phone battery modified by the heat.

According to another study on people's opinion about children using a telephone, as the issue is raised by the question, "**Should kids use smartphones?**" 60% say "yes" [17].

With all what that have been said and studied, children's vulnerability vis à vis the use of smartphone is no more to prove. Controversially as we can notice, parents are little or not at all informed on the probable dangers of smartphones and worse again on the protective measures to take. This can't help preserve children's health both psychologically and physically. In the case of the case report on Evisceration due to the mobile phone battery explosion, if information was divulgated on the chemical component of the battery and warning on its potential explosive danger, it could have been avoided to throw the battery in the household garbage. The explosion could be prevented. Therefore, the child could have escaped this accident.

## 5. Taking measures to limit or eradicate smartphone-related dangers

### 5.1. Mobile telephony companies

Dispositions should be taken to conceive nonflammable batteries for smartphones, for example, as we suggest working to reduce side effects of smartphones. In a high rate related to incidents that occurred, children are more exposed. Considering applications in smartphones, children and young people are also of high-rate users. Games, video games, cartoons, social networks (Facebook, WhatsApp, twitter) to mention but a few attract and glue this range of population to smartphones. They are targeted by the dangers that may come from smartphones.

### 5.2. Parents and governments

Twenty percent of parents do not monitor their children's use of smartphones [16]. This is a study conducted in Europe especially in England. It becomes more concerning when survey is made in African countries. No scientific study testifies but when we consider the educational rate of developing and underdeveloped countries in general, it does pass

40% (Wikipedia); however, the population rate of the consumers of smartphones passes 70% and of course this rate is dominated by young people and teenagers in average. Therefore, the issue of monitoring children's use of smartphone becomes more delicate. Actually, children master more smartphones than the parents except some parents of course. However, parents should discuss openly on undesirable things their children may come across on Internet. Prepare them on the eventual negative impact it may have on them.

Since parents can't really control everything their children do with smartphones, a protective concept of children protection against smartphone should come from the government as well.

Government should insert in the educational system a program that will inform students and raise awareness on the dangers of smartphones. Government should also ask the companies to conceive smartphones for kids under 18 with restriction on applications. The authorities should control sellers and require from them not to sell smartphones without application restriction under 18.

## 6. Conclusion

Life has become much more livable with the technology and the creation of mobile phones. Nonetheless, it may affect people's psychology, behavior, and health especially those of children. Awareness should be raised on the dangers of smartphones not only for children but also for adults. Therefore, measures should be taken to protect children and teenagers to ensure their welfare as they use smartphones.

Telephony companies as well as parents should join their effort to figure out an adequate solution for this phenomenon. A mobile phone becomes dangerous when it heats because it can explode. Yet, awareness must be raised on the use of smartphones and mobile phones in general for, as we said before, a telephone has become a real life partner in everything. Therefore, the humanity is in permanent danger.

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