The impact of smartphones and mobile devices on human health and life

By Leonid Miakotko

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Introduction

The smartphones, being a very new invention of humanity, became an inherent part of human's life. The smartphone combines different sophisticated features. It allows users to keep pictures, memories, personal info, correspondence, health and financial data in one place. Smartphones also became an integral part of modern telecommunications facilities. In some regions of the world, they are the most reliable or only of available phones. The phones allow people to maintain continuous communication without interruption of their movements and distances.

Smartphones and handheld devices (HHD) combine advanced computing capability, such as internet communication, information retrieval, video, e-commerce and other features, that makes the device is one of the necessities for many people. "Mass cell phone mobilization" covered humanity probably ten or fifteen years ago. According to GSMA Intelligence, the number of mobile devices is 7.22 billion while the US Census Bureau says this figure is still between 7.19 and 7.2 billion. The growing number of smartphones and smartphone owners raises a concern about phones' effect on human health and life.

A world-wide popularization of smartphones and a little knowledge about their side effects triggered the author to start research on effects of smartphones on human health and life. Merriam-Webster dictionary defines the smartphone as "a cell phone that includes additional software functions (as e-mail or an Internet browser)". In this research, the author implies the handheld devices that have cellphone futures.

The highlights of this research include recent scientific facts and research analysis of the smartphones on human health and life. The author also discusses advantages and disadvantages of smartphones' usage by people and brings examples of those who refuse to use smartphones.

The main key points discussed in the research paper are the effect of electromagnetic waves on human brains; effect of handheld device usage on human's upper extremities, back, and neck;

effect of the smartphone on drivers; advantages and disadvantages of using smartphones; solutions how to mitigate effect of mobile devices on human health and life.

Discussing the effect of electromagnetic waves on human brains the author introduced the latest research results conducted by the scientists and facts about the influence of wave on the human brains and cancer development. Extensive usage of smartphones has an effect on human's upper extremities, back, and neck. Studies in this area show a significant association between the total times spent using mobile device each day and pain in the right shoulder and between times spent internet browsing and pain at the base of the right thumb. This research was supported by a survey to identify the side-effect of using smartphones and hand-held devices among users between15-64. The detailed survey results are discussed in the main paper.

"Mass cellphonization" revealed proponents and opponents of cellphone users. Cellphones' proponents state that devices enhance safety, deliver education, improve transparency and root out corruption, strengthen democracy and provide access to the market, while opponents see various health risks and nature pollution.

Solutions how to mitigate influence of mobile devices on human health and life are also discussed in the main paper.

Effect of electromagnetic waves on human brains

The smartphone is a source of the eminence of electromagnetic waves. Numerous studies have been conducted in the past years to identify the effect of electromagnetic waves emitted from the cell phones on human health. The topic has been studied for a long time, but in past, it touched on a rather narrow circle of people, mostly staff of broadcast and specialized radio stations. Even at that time, measures taken to protect people from radiation apply only on those who work near powerful sources of radiation. And, despite the revolutionary changes in the field of telecommunications, as well as many discoveries and emissions, the impact of electromagnetic waves of different frequencies hotly debated ever since. As soon as mobile phones more and more part of our lives, the world is continuing research to proof whether cell phones are harmful to human health? Today there is no official statement announced by laboratory or medical center to answer this question. The complexity of the analysis of the statistical data makes the task more difficult for researchers. The impact of harmful radiation emitted from cell phones waves is still being studied.

Carina Storrs in her article “Cell phone radiation increases cancers in rats, but should we worry?” notes that “high-dose exposure to cell phone radiation increased brain tumors in male rats,” however “most studies in humans have failed to find a link between cell phone use and greater cancer risk.”

Nevertheless, researchers comment “that more work is needed to interpret the results, which some called "puzzling." The statement that cell phones can cause cancer has been not confirmed. The studies failed to proof that cellphones make a major risk develop cancer among frequent users. The main issues while conducting studies are some people may not accurately report the usage as they don’t exactly remember how often they use the cell phone (excluding speaker phone or earbuds) and it is still difficult to measure the impact of other factors that may accelerate the cancer development for excessive cell phone users.

As research results require accurate findings, the scientists moved their experiments to rodents. In these experiments, the scientists “expose mice or rats to known doses of radiation that are equivalent to what people get from their cell phones.” Based on the latest research released by National Institute of Environmental Health Sciences, the scientists found that 2% to 3% of irradiated male rats developed brain tumors, and 2% to 7% of irradiated rats developed heart tumor. It is interesting that female population is less impacted to radiation waves and it composed 1% of developed brain tumor and 2% of heart tumor of the total population of the tested species. According to John R. Bucher, associate director of the National Toxicology Program tumors were of types similar to those in other research that found radiofrequency from cell phones is a possible carcinogen.

The WHO/International Agency for Research on Cancer (IARC) has classified radiofrequency electromagnetic fields as “possibly carcinogenic to humans” and associates it with wireless phone use. In May 2011, a Working Group of 31 scientists from 14 countries met in France to assess the potential carcinogenic hazard from exposure to radiofrequency electromagnetic fields emitted by wireless communication devices, microwaves, radio, and television signals. The Working Group made a conclusion that “the evidence, while still accumulating, is strong enough to support a conclusion and the 2B classification (carcinogenic to human)”. It means that a risk of hazard exposure emitted from the cell phones exists to cause cancer, and therefore, additional observations are required.

The author also notes that considering the rapid changes in cellphones technology new observations are even more complicated to conduct. Salvatore Insiga, a neurosurgeon at Northwell Health's Neuroscience Institute in Manhasset, New York, also considers that nonetheless that there is no direct evidence of between cell phone radiation and tumor risk, the possibility still exists, and

studies should be continued. Insiga suggests alternating cell phone use by using earbuds. The Federal Communications Commission states that people could reduce their exposure to cell phone radiation by using an earpiece or headset when they talk, and by keeping the device away from their bodies.

At the same time, the scientists question why the male rats are more affected by radiation than female rats. All the animals were exposed the same amount of radiation. Another issue is whether radiation amount on tested animals is equivalent to the radiation portion that human receive using the cellphone during the day. As it said, the modified phones become more popular, and their use has increased.

However, proponents of cell phones dismissed "the possibility that cell phone radiation could cause cancer because it is non-ionizing and does not carry enough energy to damage DNA like the ionizing radiation in X-rays and CT scans does." To shed some light on the disputable questions, the National Institute of Environmental Health Sciences has launched a study. The result of the study will be released in the fall of 2017. The study will expand look at rates of cancer on other organs and tissues of animals.

Effect on human's upper extremities, back and neck caused by handheld devices

A smartphone or handheld device (HHD) combines advanced computing capability, such as internet communication, information retrieval, video, e-commerce and other features, that make device highly popular among people. According to Pew research center, the number of smartphone owners comprises 56 % of American adults in 2013 and their average daily use of the device is about 195 minutes. The number of cellphone users increases every year. Various studies show the connection between cell phone usage and physical state of the users' health. Some studies report that users complain about a headache, hand tremor and finger discomfort.

In his research, Berolo noted that mobile hand-held device users complain of discomfort at least on one area of upper extremities, back or neck. Long-term usage of the device leads to additional tension on tendons, muscles, and perimetric tissue, which could result in visual display terminal (VDT) syndrome. In the similar studies on working with desktop, the scientists recommend regular rest periods, stretching, and exercises.

In research conducted by a group of Korean scientists from Injr University an effect of cell phone on hand-held device users was "a significant association between the total times spent using a

mobile device each day and pain in the right shoulder, and between times spent internet browsing and pain at the base of the right thumb."

Telecommuting and telework are modern alternatives to office arrangement. Employees work from home office, café, park or even car. According to Lister "there are 20-30 million people who work from their home at least one day each week. Another 15-20 million work while they are on the road; 10-20 million runs some form of home business and 15-20 million works at home part of the time". In most cases, people use desktop and laptop in their home offices; however, modified cellphones or smartphone are also substitutes to a home office. In fact, for desktop computers ergonomic principle makes the workplace safer and convenient. There are different examples of adaptation desktop computers to health needs of their users (ex. ergonomically designed keyboards, pad bolster, mouse, etc.) The smartphones are not ergonomically supported, and intensive usage of smartphones increases tension on muscles such as upper trapezius, extensor pollicis longus and abductor pollicis.

Rajan Balakrishnan and Elanchezhian Chinnavan conducted research on the extensive usage of handheld devices and their impact on musculoskeletal disorder. In their work the scientists acknowledged that "prolonged use of cell phone is known to cause symptoms of musculoskeletal disorder keeping this into consideration, more study should be done in the future to create awareness among cellphone user regarding the seriousness of this matter".

The scientists used Disabilities of Arm, Shoulder, and Hand (DASH) questionnaire in their analysis. They selected 200 random students for participating in the survey and collected the survey results for detailed analysis. Based on the results, 27.5% of them were known to be unaffected by hand pain symptom, 44.5% of them were affected by mild hand pain, for moderate hand pain, there were 24% of them. Apart from that, there were 3.5% of students were known to be affected by severe hand pain and worst possible pain.

The problems associated with the HHD usage are becoming more frequent. For example, "texter's thumb" (aka "Blackberry thumb") develops as a result of using the thumbs for sending text messages. It is a form of deQuervain's tendinitis. "Texter's neck" is the term used to describe neck pain that results from prolonged poor posture while using a smartphone.

The author conducted a survey to learn the influence of smartphones, HHDs and other mobile devices on human health. The study was taken by a group of males and females within the age range from 15 to 56. During the interviews, respondents answered six questions.

Survey results: Five males and five females participated in the research. The survey consisted of six questions, and it was conducted in New York. The respondents preferred to preserve confidentiality and their names alphabetically assigned. The responses are summarized and consolidated below:

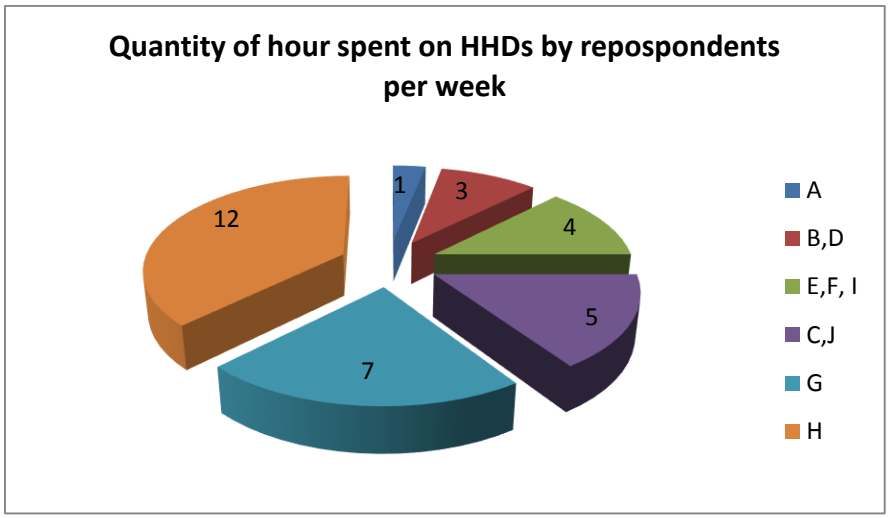
Demographic data

Name	Age	Hours spent on smartphone or HHD
A	56	1
B	39	3
D	36	3
E	15	4
F	27	4
I	42	4
C	39	5
J	35	5
G	28	7
H	18	12

QUESTIONS:

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

All respondents use hand held device from one to twelve hours per week. The data is consolidated in the chart.



2. For what purpose do you use you smartphones/HHDs most: texting, conversation, entertainment?

The respondents use smartphones/HHDs for all three purposes. However, during interview respondents were asked to prioritize activity while using smartphones/HHDs. Most respondents (5 out of 10) use HHD for texting; three use mainly for conversations and two for entertainment.

Name	Age	Purpose
A	56	conversation
I	42	conversation
J	35	conversation
E	15	entertainment
H	18	entertainment
B	39	texting
D	36	texting
F	27	texting
C	39	texting
G	28	texting

3. Have you experienced any discomfort or pain in shoulder or hand after prolonged usage of smartphones/HHDs?

Nine out of ten respondents confirmed that they felt discomfort in shoulder and hand after prolonged usage of smartphones/HHDs.

Name	Age	Hours	Purpose	Discomfort in shoulder and hand
A	56	1	conversation	no
B	39	3	texting	yes
D	36	3	texting	yes
E	15	4	entertainment	yes
F	27	4	texting	yes
I	42	4	conversation	yes
C	39	5	texting	yes
J	35	5	conversation	yes
G	28	7	texting	yes
H	18	12	entertainment	yes

4. Have you experienced tangling sensation in your arm, shoulder or hand after typing on smartphones/HHDs?

Seven respondents out of ten agreed that they felt tangling sensation in arm, shoulder or hand after extended typing.

Name	Age	Hours	Purpose	Discomfort in shoulder and hand	Tangling sensation in arm after extended typing
A	56	1	conversation	no	no
B	39	3	texting	yes	yes
D	36	3	texting	yes	yes
E	15	4	entertainment	yes	no
F	27	4	texting	yes	yes
I	42	4	conversation	yes	no
C	39	5	texting	yes	yes
J	35	5	conversation	yes	yes
G	28	7	texting	yes	yes
H	18	12	entertainment	yes	yes

5. Have you experienced such symptoms as a headache, fatigue, distraction, inattention after prolonged usage of smartphones/HHDs? *(Prolonged usage is considered more than two uninterrupted hour of smartphones/HHDs)*

Six respondents out of ten confirmed that they had symptoms such as a headache, fatigue, distraction, inattention after using HHDs more than two hours.

Name	Age	Hours	Purpose	Discomfort in shoulder and hand	Tangling sensation in arm after extended typing	Symptoms(headache, fatigue, distraction, inattention)
A	56	1	conversation	no	no	no
B	39	3	texting	yes	yes	no
D	36	3	texting	yes	yes	yes
E	15	4	entertainment	yes	no	yes
F	27	4	texting	yes	yes	no
I	42	4	conversation	yes	no	no
C	39	5	texting	yes	yes	yes
J	35	5	conversation	yes	yes	yes
G	28	7	texting	yes	yes	yes
H	18	12	entertainment	yes	yes	yes

6. Have you experienced any eye tension or insomnia after using smartphones/HHDs longer than 2 hours?

All respondents felt eye tension after prolonged smartphones/HHDs usage. Two out of ten experienced insomnia after using HHD longer than two hours.

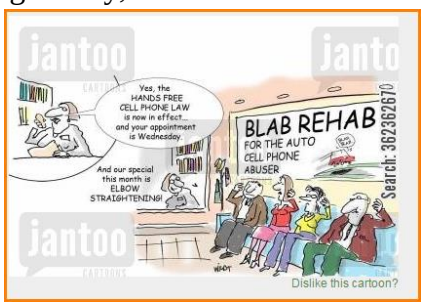
Name	Age	Hours	Purpose	Discomfort in shoulder and hand	Tangling sensation in arm after extended typing	Symptoms(head ache, fatigue, distraction, inattention)	Eye tension	Insomnia
A	56	1	conversation	no	no	no	yes	no
B	39	3	texting	yes	yes	no	yes	no
D	36	3	texting	yes	yes	yes	yes	no
E	15	4	entertainment	yes	no	yes	yes	no
F	27	4	texting	yes	yes	no	yes	no
I	42	4	conversation	yes	no	no	yes	no
C	39	5	texting	yes	yes	yes	yes	yes
J	35	5	conversation	yes	yes	yes	yes	no
G	28	7	texting	yes	yes	yes	yes	yes
H	18	12	entertainment	yes	yes	yes	yes	no

Interview results revealed that extended usage of smartphones/HHDs affected human health. Mainly, prolonged usage of smartphones/HHDs increased tension on muscles such as upper trapezius, extensor pollicis longus and abductor pollicis and caused eye tension and fatigue. Meantime, only two respondents admitted that they had experienced insomnia that might be caused by the extended usage of smartphones/HHDs.

Effect of smartphones on drivers

The potential risk of using smartphone use on drivers' health is critical. A person who drives a car and simultaneously uses a smartphone is at high risk to get into the accident and damage own health or compromise life of passengers or pedestrians. According to the National Safety Council (NSC) 27 percent of car crashes—or 1,535,490 in 2013—were caused by cell phone use and six percent of cellphone-related crashes were texting related.

Regretfully, behind the numbers were real people with their lives - relatives, friends, colleagues;



everyday choirs, love, disputes, obligations, and responsibilities. This long list that one day ended up for some of them with a ring of the cell phone or a text notification. Nana Sidibe in her article "More phones, more wrecks? Distracted driving on the rise noted "because of the ubiquity of mobile devices; drivers are more distracted than ever", and the result is a bigger number of car accidents.

The "boom in cellphone" adds the costly problem of death and injuries happened due to the usage of mobile devices on the road. In an interview with CNBC this week, the CEO of the NSC, Deborah Hersman acknowledged "the percentage of cell phone related crashes isn't surprising since cell phone use behind the wheel happens frequently. The challenge is to find a solution". People tend to mirror and reproduce the actions that most other people do. According to the Centers for Disease Control and Prevention, "distracted driving kills nine people and injures hundreds of others on a daily basis. It also costs taxpayers billions per year". In a 2014 study, the National Highway Traffic Safety Administration (NHTSA) estimated the total economic cost of motor vehicle accidents at $277 billion.

In her article "Cellphone use causes over 1 in 4 car accidents" for USA Today, Gabrielle Kratsas mentioned that the NSC report, combined with Texas A&M research institute's "Voice-to-Text Driver Distraction Study," warns drivers that talking can be more dangerous than texting while operating a vehicle, and the use of talk-to-text applications is not a solution". Based on the survey, the manual texting took slightly less time than the voice-to-text method; however, in both tasks, the driver's performance was almost equally affected.

There are two main factors that contribute to unsafe driving: handling the phone (dialing, answering, text messaging, etc.) and the conversation introduced to the environment. Conversation involves big amount of the driver's time and attention from concentration on the road and "especially his/her ability to react when seconds count". The National Safety Council reports that in simulated driving tests, the drivers who carried on a cell phone conversation were so distracted that they went unaware of some traffic signals. The study also examines the psychology of a conversation, "especially the participation level required, versus other "listening" behaviors such as audio books and news radio". It shows the drivers more emotionally engaged into conversation than if they listed radio or audio and, as a result, they became "less attentive to safety signals". The studies show that "use of a cell phone impairs a driver's ability as much as driving drunk".

In its study "100-Car Naturalistic Driving Study," the Virginia Tech Transportation Institute states that two above cell phone behaviors were very remarkable contributors to "crashes, near-crashes, and incidents." The massive increase in incidents is primarily instigated by manual cell phone manipulation, with passenger interaction a close second. The results showed overwhelmingly that talking on the cell phone led to the highest level of incidents, an astounding level of near crashes, and, where cell phone use contributed to driver distraction, cell phone conversation led to the most crashes.

The popularity of cell phones among teenagers is tremendous. Texting is a way teens communicate via cell phone with friends "quickly and conveniently." In fact, teens comprise the large group of drivers distracted by dialing and text messaging. Another risk group is business professionals, who practice texting to communicate to business partners. For the teenage group the deteriorating factor is a lack of driving experience in comparison to more savvy, mature drivers. Regretfully, the both risk group aware of the potential risks of using hand or hand-free mobile devices while driving, however, they often agree to accept such risk to meet their personal or professional goals.

But what could be done to cut down on accidents caused by cell phone use? Herdsman comments that "over 8 million employees are covered by bans from their employers on driving while using cell phones". In her interview, she notes the actions should be considered as regular business practice accepted by people, rather than legal obligation enforcing people to comply with the regulations. She also considers the new technology could mitigate accident risks connected with cell phone usage. As an example, she brings collision-avoidance technology in cars, "I do think when it comes to the cell phone or in-vehicle device use, anything that is nomadic or in vehicle, we will get smarter about that and technology can prevent the driver from being distracted." The future opportunities for the self-driving cars are being currently developed by companies such as Google and even tested in some countries.

The leading cell phone companies also take actions to alert their clients to the risk of using the mobile devices on the road. In early 2013, Verizon Wireless, Sprint and T-Mobile, united behind AT&T's "It Can Wait" campaign, launched their first joint advertising campaign against texting while driving and against the misuse of the devices.

The alternative hands-free cell phone is also far from the best solution and prevention of accident on the road. According to studies of the Journal of Safety Research, "driving performance while using a hands-free phone was rarely found to be better than using handheld devices". In the full NSC report, the effect of driver's mental workload on the cognitive distraction scale was driving and talking on a handheld phone had a 2.45 workload rating, and driving while talking on a hands-free cellphone has a 2.27 workload rating, usage of the speech-to-text application while driving

had a 3.06 workload rating. The accurate reporting is also affected by the data collected on accidents and fatalities caused by cellphone use on the road to be “under-reported due to the lack of drivers willing to admit to using their phones”.

In response to such challenge and to protect the citizens many states in the United States have made it illegal to use handheld devices while driving. According to the Governors Highway Safety Association, out of the 43 states that have banned texting while driving, all but five have primary enforcement of their laws, meaning an officer may cite a driver for texting without any other traffic violation taking place (2014). Edgar Snyder & Associates published on their website that New York State bans handheld ban for all drivers and texting for all drivers (Primary law).

Advantages and disadvantages of using smartphones and HHDs

Cell phones and poverty

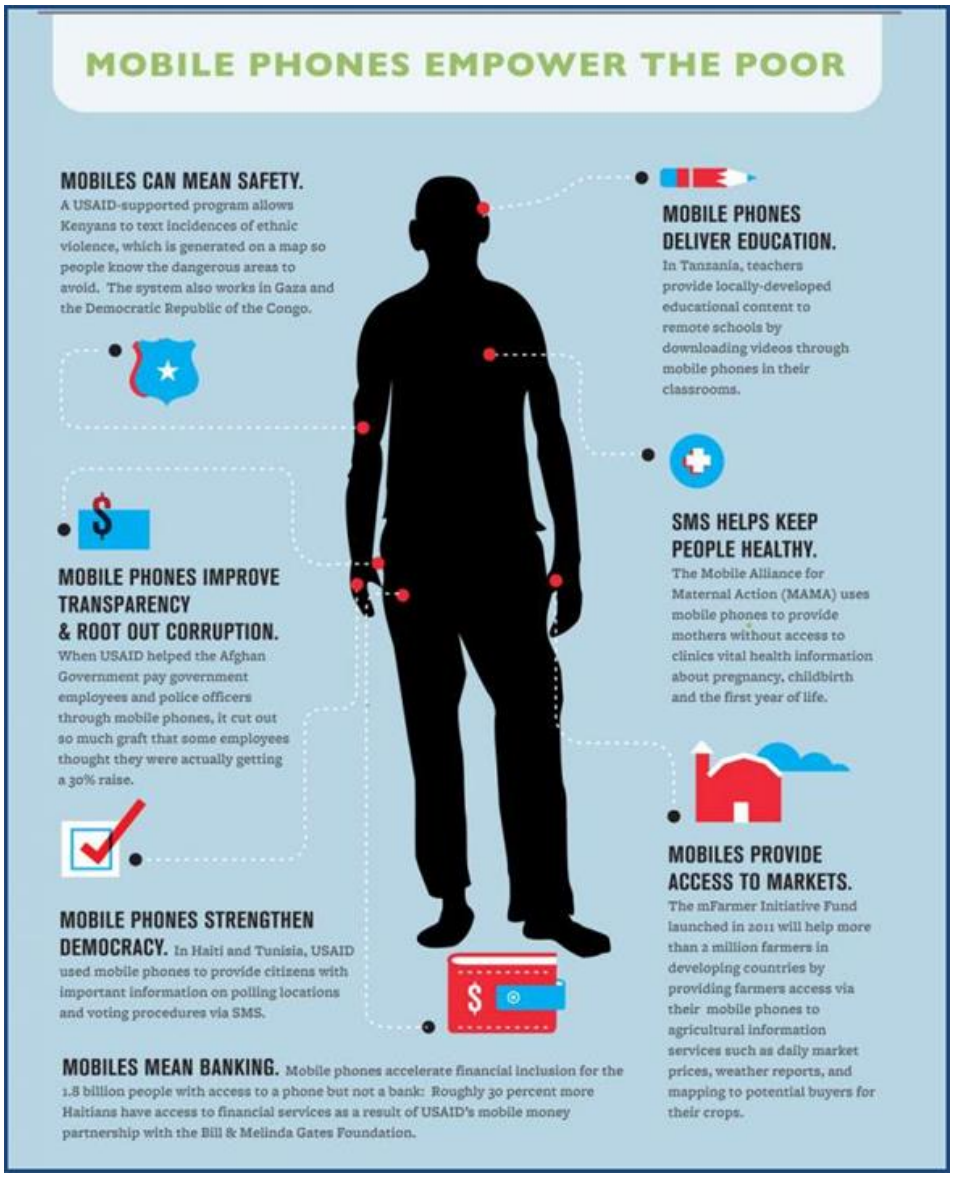
Joseph Wood Kruth said “Technology made large populations possible; large populations now make technology indispensable,” another world-known scientist Albert Einstein almost seventy years ago noted, “It has become appallingly obvious that our technology has exceeded our humanity.” At his time, the genius professor could not imagine that in less than 70 years the number of mobile devices officially exceeds the number of people in the world. *According to GSMA Intelligence, the number of mobile devices is 7.22 billion while the US Census Bureau says this number is still between 7.19 and 7.2 billion.*

Kevin Kimberlin, Chairman of Spencer Trask & Co says “no other technology has impacted us like the mobile phone. It's the fastest growing manmade phenomenon ever -- from zero to 7.2 billion in three decades". In his article to “Independent” internet –magazine Zachary Davies Boren Gadgets notes “gadgets like tablets, smartphones and not-so-smart phones are multiplying five times faster than we are, with our population growing at a rate of about two people per second, or 1.2% annually”. Considering these figures, I unintentionally recall “It has become appallingly obvious that our technology has exceeded our humanity”

Meantime, mobile devices help people to improve their life standards. Once Mahatma Gandhi, Indian political and spiritual leader said, “Poverty is the worst form of violence." Poverty brings sorrow, crimes, unfulfilled dreams and ruined lives. Cell phones allow their owner access to information, services, education and communication for free or for an affordable price. Mobile technologies empower the people to take control of their future. The handheld devices transform the way people interact with one another, official institutions, access basic health, education, financial and business services. According to USAID, mobile devices have following impact on

the society " increase of 10% in mobile penetration can raise the annual GDP growth rate by as much as 1.2% in a developing country; 93% of female mobile phone users feel safer with a phone; 85% feel more independent; 41% use their phones to increase their income and professional opportunities"

Interesting fact that when "USAID helped the Afghan Government pay government employees and police officers through mobile phones, it cut out so much graft that some employees thought they were actually getting a 30% raise".



(Picture taken from USAID)

To better understand why cellphones gain such popularity and how it helps in daily life, the author looked for "defenders." Alberto G. shared his story how cell phone helped him in his "rainy days". He agreed to answer the questions after he learned that his answers contribute to the research paper

about cell phones. Answering a question what cell phone means for him, Alberto responded without any doubts "It means everything for me… my health, my bank, my shopping, my work and personal life". He told the story how he was desperate to find a job, after his lay off in 2008, and using cellphone he was able to find it. During the interview, he also learned about the risks that cell phones had on the human body (brain, neck, etc.,). Nevertheless, all these facts didn't change his attitude to mobile phones.

After losing his job as a bookstore manager in New York City in 2008, Alberto, 37, also lost his home. Since then, he had been living under the friends' roof looking for a job and apartment. Nevertheless, Alberto was short for money; he always paid his monthly cellphone bill, which provided him with unlimited minutes, texts and some data. In some instances, he cut back on his food expenses to ensure he could pay the cellphone bill. In this challenging situation, he used a cell phone to follow up on job and housing leads, to keep in touch with public employment agencies, which sometimes followed up with phone calls instead of asking to come into an office in person. Alberto used the cell phone to talk to his family and friends, who emotionally supported him through these challenges. Finally, he got a call from the agency and was invited for an interview in one the biggest NY companies. Now, Alberto works now in Melville House Publishing and Bookstore. Since that time he considers cell phone as a "friend."

Often people in need are considered the most vulnerable in the society. When they gain access to mobile services for an affordable price, they could improve the situation by getting access to various public services for free within reasonable time frame. In most cases, those people discount the health risks connected to the usage of cell phones for the sake of communication and access to information, especially if such access can change their circumstances and improve their life quality.

Can people live without cell phones?

Notwithstanding on enormous number of cellphone owners, there are people who live happily their lives without cellphone or HHDs. Once talented musician wrote, "I never thought of myself as being handsome or good-looking or whatever." The talented singer and musician, who is free of stigma, and who created such amazing songs to empower millions people around the world and …doesn't have a cell phone.

In today's world, it is normal that people have one or more cell phones. However, there are still some individuals who refuse to use cell phones. They prefer to live a good old-fashioned lifestyle, without staring at the screen and to be disturbed by texts, calls, facetime, etc. There are also some celebrities who don't use cell phones, and they probably don't care what other think about it. For example, Sir Elton John is completely against the use of technology, and he is for a global shutdown of the Internet. He thinks it is possible to live without technology. Sarah Jessica Parker

is another celebrity who doesn't use cell phones and prefer emails to phone calls. She is afraid that her voicemails may get lost in a full voicemail box. Another example is Christopher Walker. During filming, the famous actor gets a cell phone from the producers to be reached out. However, at the end of filming, he always gives it back. The legendary actor also doesn't own a computer and doesn't use the Internet. Another legend actor, Tom Cruise doesn't use cell phones because of Scientology. A fashion star Karl Lagerfeld doesn't use computers and phones, and he is probably the only person in the fashion industry who used computers for decorating and not for chatting online. Simon Cowell prefers to avoid cell phones. However, he has one basic for emergency calls. The one of the famous producers in the music and TV business is not interested neither cell phones nor newest apps. Warren Buffet believes "you shouldn't get rid of the things unless you had them for 20 or 25 years." The powerful business magnate has a very old and basic Nokia flip cell phone. A billionaire in real life, he lives a very modest life in a three bedroom home.

Source: www.video.vogue.com

It happens that a person who doesn't own a cell phone on purpose is often stigmatized by society causing sympathy or considered a socially impaired. Anne Fonte in her article "Hold the Phone: What It's Like Not to Own a Cell Phone" said "Cell phonelessness becomes is no longer neutral. It becomes abnormal, antisocial, and a threat to others. Cell phones are no longer just a choice you might make, like deciding who to vote for or choosing not to have children or plastic vs. paper. According to the Pew Research Center, 91 percent of American adults now have cell phones, and in the last couple years I've noticed the mania ratcheting up to a full-blown obsession. People work, sleep, walk and drive with their cell phones. Each year, cell phones play a part in more than 1.6 million car crashes. Forty-four percent of cell phone owners sleep with it next to their bed, so they don't miss any calls or texts during the night. They take them out during movies, in the middle of conversations, and even during sex. Sixty-seven percent of cell phone owners check their phones even when they haven't rung. I can no longer simply agree to meet a friend at a place on a certain date without confirming on the phone several times, and if we do manage to meet up, their phone will inevitably be involved in our discussion." Alex Morritt said "The more time we spend interconnected via a myriad of devices, the less time we have left to develop true friendships in the real world."

To learn more about an attitude of people who have the cellphone to those who do not own cell phones, the author conducted a survey. Five questions were addressed to the group of ten people within an age range from 17 to 54. The purpose of it was to learn their opinion about people who don't own or use cell phones.

The results of the survey are presented in the table below.

Question	Yes	No
Do you have a cell phone?	10	-
Do you have friend, colleague or relative who doesn't use or own a cell phone?	-	10
Do you think it is normal not to use a cell phone?	-	10
Would like to keep a relation with person who doesn't use a cell phone?*	2	8
Could you stop using your cell phone or smart phone?	-	10

*While responding on this question some respondents admitted they might have keep relations with a person, however it would be difficult communicate to each other.

The survey results show that the cell phone users have some social bias to people who do not own the cell phones.

To advocate a position of cell phoneless people, Lindsey L. used her actual story to "Yes and Yes" internet magazine, where she described her experience living without a cell phone. Lindsey is a herbalist, wellness guide, yoga teacher, and poet. She has a small business in non-profit management and social services. She is 38 and describes herself as "falling in love with the challenges, heartbreaks, joys, and beauties of this world with each waning day". Her attitude to technology she phrased using a quote of Albert Einstein "The intuitive mind is a sacred gift, and the rational mind is a faithful servant. We have created a society that honors the servant and has forgotten the gift." She believes that technology is "truly a crisis of the spirit," therefore she lessens her link to technology. To meet someone, people learn that they have to be more intentional about setting a good location and time for the meeting. Lindsey refuses to have a cell phone even for an emergency, motivating that "so many other people have cell phones, that it would be easy to contact them for help if I needed some". Another interesting thing is dating. She is still in the dating period of her life. And, she loves that men she spends time with can't just text her random thoughts. She prefers that he calls her using a land-line connection. In her words "she created a safer, saner world by not using a cell phone". Lindsey feels that cell phone free bars and restaurants

of the future will be equivalent to smoke-free bars and restaurants of the present. She said, “At first, people will be offended. But, later they will see they were submerged in a virtual smoke cloud”. Lindsey believes that lessening the amount of technology she has opened up a wellspring of intuition and creativity. She’s freed up space for her mind to wander and create. The minds are un-constructive and free-form space, while technology is just something to help manifest more fully in the world.

Solutions to mitigate impact of cell phones and mobile devices on human health and life

The cell phones and handheld mobile devices have diverse capabilities. The more diverse the functions of the cell phone the stronger are attachment of the user to the device. The extensive cell phone usage leads to various health dysfunctions, including pain in the neck, fingers, fatigue and emotional misbalance.

To contrast the massive “cellphonization” some celebrities promote “free cell phone” life. They show that the world is full of attractions, and they can enjoy the life without checking messages every 10 minutes.

However, proponents of the “cellphonization” say that cell phone is useful in their daily life and help to keep up with a vigorous rhythm of the modern life. People admit that overuse of cell phone may not be healthy for them; however such technological benefits like immediate access to the Internet, free and fast communication, information storage disregard risks of health dysfunctions.

To mitigate the dependency from the cell phones and HHDs, without device denial, some diverse and alternative solutions can be considered. The solutions are not so dramatic to deny any form of cell phones, however at the same time such measures allow the users mitigate dependency and relocate attraction to other activities:

Solutions

- Cut off the Internet once the usage reaches the maximum data allotment.

The ideal solution is to limit access to the Internet for teenagers. Parents can adjust settings and apply limitation when the data reached the maximum.

- Socialize without cell phones. Encourage your friends to pile the phones in the middle of the table during the meal and whoever touches or grabs their phone has to pay for the table.
- A pledge to take a 'tech time-out'

There is an excellent opportunity for the device owner to test how strong his/her willpower. The person may pledge to spend some time (at least two hours) without any form of disruption from technology, and once time passed, he/she are allowed to check their phones or other devices.

- Order to “"Be Present" boxes“

This “innovation” may alert a cell phone owner about his/her addiction to the device. The simple box is intended to store the device from the owner and limit visual attraction to check the cell phone.

- Interest group

A fraternity benefits society providing a support base for its members. This idea can be successfully employed by the people who would like to cut device addition, but needs some support to start and continue the challenge. It is noted that person who pledges to him/herself could easier renege on the commitment, while promises made to the group encourage the person to complete/or at least try the challenge.

- “Break free” App

Surprisingly, but device offers some treatment from addiction to itself. The new Android offers their users a new app for monitoring and taking control of your smartphone usage habits and your digital life. The application called “BreakFree” helps to check owners’ addiction levels, and it also can unplug and disconnect the owner from smartphone. If the device owner spends unhealthy amount of time on smartphone and feels addicted, the BreakFree can help to take control of the life, focus and spend time with the people to care about. In my opinion, the description sounds too good to be true, considering that it comes from the device software developer, and dependency on the new app may strength the addiction.

- Personal development

The best way to limit addiction is to develop some “contingency” plan. The device owner may proportionally allocate time for personal growth including work out, learning, reading or socializing (not on Facebook!).

The side effects of cell phones on human's physical state could be improved with physical exercises and stretching. Dr. Julia Evergreen Keefer, an NYU Professor, a kinesiologist, massage therapist, fitness instructor, and creator of four trademarked classes, offers a series of exercise in her e-book "From Pain to Performance".

The set of exercises developed by Dr. Keefer is an excellent start to mitigate side-effects from cell phones on a neck, fingers, arms and eyes as well as an emotional dependency on electronic devices living "versus Electronic Media Performance". Some of the exercises from that series are introduced in the paper as examples how to mitigate side-effects on human body caused by the cell phones and mobile devices.

Neck, fingers and arms

Correct alignment, extensor strengthening, pigeon, isometrics. And ROM. Subtle exercises. Posture check against wall. Look right and left. Seesaw neck. Shoulder shrugs. Stretch neck and shoulders but NOT if you have cervical radiculopathy! Make gentle, soft arm movements to the side, front and back without moving neck. As you move away from the wall, lead with your chest, not your head. Review sleeping posture on back with horseshoe or on side with pillow but without too much forward flexion

Pigeon off table or bed to strengthen extensors. Lie on back for single or double thigh flexions and keep head resting on floor. When your arm is so weak you can't move it then it may be time for surgery or if you have just been in a devastating accident. However, neck surgery is a very risky business. So are high velocity chiropractic adjustments in this area. The neck is a delicate seesaw. Lengthen it like Alice in Wonderland. If you have a rounded shoulder posture with shortening of your pecs and neck extensors, you may be prone to neurovascular compression. Neck flexors should be strengthened eventually by lifting chin towards chest in a back-lying position.

Rock climbers have the best forearm strength. There are many sophisticated products on the market to improve grip such as the Power Web Comb for $39.95-a rubber mesh web that targets the tops of the arms as well. Insert fingertips into the hole and then spread the fingers to work the extensor muscles. There is also a Dyna-Flex Powerball with a meter. When wound in small circles, the gyroscope in this device spins quickly, creating resistance that forces the user to grip tightly.

Performance: Vary the rhythm of your squeeze from short quick bursts to long holds.Make sure you strengthen your opening as much as your closing.

Grip Exercise

Power grip is the strongest grip, the one you need to hold a hammer, climb a rope, or rock climb. Precision grip is used for delicate, subtle movements like writing, eye surgery, 1or needlepoint. Hook grip is used when performing chin-ups or holding the barbell; sweaty hands can interfere with this grip.

Eyes

Clock exercise

With this next eye exercise, you've got to use your imagination. Begin in a seated position and close your eyes. Imagine a clock in front of you. Visualize the numbers 12 and 6. With your eyes still closed, rotate your eyes down from 12 to 6 in a clockwise rotation. Do this 15-20 times. Next, see the numbers 3 and 9. Still in a clockwise motion, rotate your eyes from 3-9 about 20 times. With your eyes still closed, rotate

your eyes in a counter-clockwise movement several times as well. This exercise can do wonders to help correct blurry vision problems!

Focus exercise

Focusing on objects both near and far is an excellent way to train your eyes. To begin, start in a comfortable but upright position. Put your thumb about 10 inches away from your eyes. Focus on your thumb, every excruciating detail of it, for a few seconds. Pick an object in your surroundings that is about 10-20 feet ahead of you. Focus on that object for a few seconds and then jump back to focusing on your up close and personal thumb.

Blink exercise

The simple act of blinking can help you focus on objects better in your daily, seeing day. Spend a great deal of your time looking at computer or cellphone screens, people probably don't blink enough. People get so focused on the screen that we actually forget to blink. Blinking both relaxes and rehydrates our eyes. Take a few minutes every few hours and focus on blinking. Blink every 3-4 seconds and know that you're helping your eyes be better able to serve you later on.

Conclusion

Steven Spielberg said "Technology can be our best friend, and technology can also be the biggest party pooper of our lives. It interrupts our story, interrupts our ability to have a thought or a daydream, to imagine something wonderful, because we're too busy bridging the walk from the cafeteria back to the office on the cell phone". Smartphones and mobile devices became an integral part of the most people live. The influence of cell phones and their effects on human health are still being tested and studied. There is no one single opinion if cellphones bring harm to human's health. However, addiction and huge reliance on cell phones carry some risks on human development and health. The risks are emotional, physical, social and psychological. Saurabh Sharma noted, "A smartphone is an e-toy designed for the lonely inner child hidden in each and every one of us." By conducting this research, the author tried to bring attention to potential risks that cell phones can cause to the users and provide some solutions how to mitigate side-effects of cell phones and mobile devices on the users by limiting cellphones/smartphones and handheld devices usage or with special physical exercises. The advancements of modern technology, particularly, handheld devices (HHD) (smartphones, cell phones, and mobile devices, etc.) are tremendous. However, prolonged use of devices may cause symptoms of the musculoskeletal

disorder, thumb (deQuervain's tendinitis), and neck. Given that more studies should be done to create awareness among cell phone users about the seriousness of this matter.

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