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Health Risks Associated with the Use of Smartphones



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ABSTRACT

Smartphones, a type of mobile phone, are widely used in Japan. This is thought to be due to its multi-functionality and portability, but many problems have been reported due to its usage in recent years. Smartphones may be not only causing direct harm but also deteriorating relationships with others. In this study, we discuss the dangers associated with smartphones in particular and present our opinions regarding measures to prevent them.



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INTRODUCTION

Smartphones are smarter and closer to personal computers (PCs) than multifunctional phones (feature phone) that were widespread in the late 20th century. It is a type of mobile phone, but it is sometimes also referred to as a form of portable PC. While old mobile phones could only make calls, feature phones that became popular after the 1990s comprised various features, such as the ability to access the Internet. However, there were only a few applications that could be used besides the basic ones, such as e-mail and calendar, and the access to the Internet was limited, unlike on PCs. In 2007, Apple introduced its first iPhone. Similarly, smartphones like the iPhones had unlimited access to the Internet, the ability to rewrite applications, and could use Wi-Fi functions. They had the ability to install many types of applications, such as information creation, recording functions, digital cameras, music, personal information management, schedule control and address books, maps and traffic information, navigation and transfer guidance, and games. Nowadays, it has become easy to link home appliances (for example, air conditioners, security cameras, and headphones) using a Wi-Fi connection, making it possible to operate and monitor them through a smartphone. Smartphone penetration in Japan surpassed that of feature phones in 2013 and reached 71.3% for all generations, especially 96.8% for those in their 20s, in 2016. Smartphones are no longer the most common form of mobile phone in the 2010s (Fig. 1).

In recent years, the influence of smartphones on the human body has been questioned. Examples include smartphone dependence, insomnia, and children's developmental disorders. Therefore, we think that it is necessary to look back on how to use smartphones and not use them just because they are convenient. In some cases, it may be necessary to restrict its use in accordance with laws and regulations. Cases involving smartphones have also been taken up in the media. In recent years, the use of smartphones while walking or driving have become a grave concern in Japan due to posed safety risks. In this article, we show the disadvantages of smartphones reported in Japan and around the world and provide the opinions of the authors on how to use smartphones.

Negative effects of smartphone on the human body

First, negative effects of smartphones on human body will be described. The disease called smartphone syndrome has symptoms associated with straight neck due to continuous use of smartphones for a long time (neck pain and stiff shoulders, dizziness, and nausea in severe

cases) [2]. In particular, women have been found to increasingly report this symptom. A normal neck bone is curved forward to support the head, while a straight neck is a straightened body that loses its curve due to poor posture or chronic fatigue.

Texting thumb refers to the way fingers get deformed and the muscles adhere to each other depending on how the smartphone is held, resulting in an injury where the fingers do not bend and lead to long-term pain. This happens when the lower part of the smartphone is held with the little finger and the weight of the smartphone is concentrated on a part of the little finger, gradually causing deformation.

Symptoms of smartphone-induced presbyopia indicate that the use of a smartphone for a long time hardens the muscles that move the eye lens, which helps in adjusting the focus of the eyes and causes long-sightedness [2]. If it becomes chronic, it can lead to persistent presbyopia, that you have short-sightedness but not long-sightedness. In addition, depending on the posture of looking at the screen of the smartphone, that is, facing downward for a long time or wring posture may cause pain in various parts of the body, such as shoulder, waist, and face.

Smartphones are also said to cause insomnia [2]. The effects on sleep include physical effects caused by light emitted from the display screens and mental effects caused by excitement depending on the content. In the former case, most displays, including smartphones, emit visible light called the blue light. It has been found that exposure to blue light for a long time suppresses melatonin in the body, which causes insomnia. In particular, the amount of blue light tends to be higher in smartphones and mobile phones than in other devices. It is also said that when these symptoms become chronic and severe, they may trigger mental illness, such as depression, autism, anxiety disorder, and attachment disorder. It can be reduced to some extent by using the blue light filters available on smartphones and wearing special glasses. In the latter case, the type of content seen on smartphones may affect the mental health of a person. For example, listening to intense music or playing a fast-moving game may disturb the balance of the autonomic nervous system and cause sleep disorders. At other times, you may not be able to sleep because of constant notification sounds, such as SNS notifications and email at midnight. As a countermeasure, it is necessary to avoid using smartphone before going to sleep and turn the smartphone on silent mode.

Prolonged use of smartphones may also be associated with mental illness. Between 0 and 2 years of age, the brain grows about three times as big; therefore, the effects of using a smartphone at this age cannot be ignored. Excessive stimulation of the brain due to smartphones can cause attention deficits, cognitive delays, and learning disabilities. When used by elementary, middle, and high school students, it is said that about 30% of student's lives are affected. Once children start using smartphones, they get hooked on games and the internet. They experience unwillingness to study and lack of enough sleep (Fig. 2). This act of engaging with a smartphone is called smartphone addiction. Relying on the use of smartphones results in disincentive to do other things and disrupts life. If you cannot use it, you begin to feel anxious. In Japan, the number of people suffering from this addiction has recently increased. Simultaneously, the name of the disorder has become very popular and its epidemic is of concern.

According to a survey by Tohoku University, it has been reported that the level of academic achievement has reduced due to smartphone addiction [3], but later, it was disproved [4]. It stated that it was not because of the smartphone itself, but because one experienced fatigue after using smartphone for a long time. This is because studying efficiency is reduced due to reduced concentration. Similarly, smartphones and tablet devices are sometimes given to infants to play with, and there is a concern that it may lead to mental illness [5]. We interpret this as a problem with using it for too long to communicate with others.

Cases and laws involving smartphones

In Japan, problems like bullying and encountering strangers after talking to them online are likely to be due to the increase in the use of smartphones. E-mailing, chatting on SNS, and communicating with free phone applications may cause "bullying." Casual transmission of information and unauthorized apps can lead to crimes, such as "privacy leaks" and "fictitious billing fraud." You may be charged a lot of money for over-downloading games and music. People need to be careful while using smartphones as they can easily access harmful sites out of sight compared with PCs and are more likely to have trouble with people who easily meet online. Therefore, measures have been taken, especially for children, and the use of smartphones by minors has been restricted in various places. In April 2014, calls were made at all 21 elementary and junior high schools in Kariya, Aichi Prefecture, to ban users from using smartphones after 9 pm. In August 2014, the use was similarly banned after 10 pm in

Kasugai City, Fukuoka Prefecture. Some smartphones have limited functionality or allow parents to monitor usage status in minors remotely.

Recently, the number of people using smartphones while doing other things has increased rapidly, resulting in traffic accidents [6, 7]. In particular, people are focused on using a smartphone while walking or driving a car. A large number of cases have been reported regarding the former. If you are absorbed in playing games and neglect to pay attention to the surroundings, you may run into other people and get in a fight or you may fall off the platform of the train station and lose your life. Even if you are not staring at the screen continuously, your attention may be distracted by calls, and you may get injured by stumbling on a step or falling from the stairs. Traditionally, these phones and PCs were wired and could only be used indoors in limited places, but now smartphones can be carried anywhere. As a result, it can be said that it may be harmful to use smartphones while the attention is dispersed and reduced outside. There is no specific law for this in Japan yet. However, in the state of Nevada in the United States, there are regulations on using a smartphone while walking, and violators are fined \$85 [7].

Furthermore, there are many cases where an accident occurs when using a smartphone while driving a car. Some reasons for this could be: 1) the “map” function of the smartphone that acts as a substitute for the navigation device of the car and 2) popularity of some augmented reality games that use GPS to detect position [8]. Higher speed movements in a car increase the distance traveled and the game progresses faster. Therefore, the number of cases where a smartphone is used while moving in a car has increased significantly. It is probable that an accident, such as a rear-end collision with another car, occurs due to distraction. Due to the increasing number of such accidents, the act of using smartphones while driving a car was severely punished since December 2019 [6, 9]. Penalties have been tripled. Now, making a call or even using a smartphone inside a car that is in motion is considered to be a violation. However, smartphones can be operated using voice recognition, and it is not against the law if you make a call wearing earphones [6]. It is questionable whether the car can be carefully driven even under such circumstances. As a solution, a company that manufactures and sells smartphones is developing smartphones that cannot be operated while moving, including on foot [7]. It is not possible to add this function to all smartphone models as it would hinder its use while riding a bus or train. Hence, it is not a fundamental solution.

CONCLUSION

Mobile phones and smartphones are very convenient tools, but if they are used incorrectly, there is a risk that they may cause problems in our daily lives, such as getting injured, falling ill, or being involved in friendship problems or crime [10]. Even if you do not intend to do so, you may become a perpetrator yourself by attacking someone depending on the content of the information transmission. Most mobile phone and smartphone problems are caused by emails, browsing sites, and using various applications. A useful app may be leaking your personal information without your knowledge. Furthermore, constant use of SNS and being unable to let go of the smartphone also interferes with sleep. It is important to use it while being aware of the potential dangers associated with it.

People need to be made aware of how to use smartphones and prevent cybercrimes. At present, almost everybody owns a smartphone, and it may be necessary to educate them in regard to using a smartphone in advance. To prevent physical harm in individuals, such as wounds, it is necessary to avoid excessive use of smartphones. However, due to its multifunctionality, the usage time tends to increase as a whole when it is used to access many applications, such as to make calls and play games. It is also necessary to revise the act of using it without considering the time and place because it can operate by receiving radio waves. In addition, this requires self-control. In the case of minors, it may be necessary for parents to limit the time and length of their smartphone usage before they start using it.

Mobile phones and smartphones are now used by many people as daily necessities in Japan. Nowadays, with the help of smartphones, it is possible to: confirm the safety and location of the child by the parent, generate computerized passes or tickets for public transportation, use electronic money, transmit information and confirm the attendance of university students from schools, etc. Not owning/using a smartphone has its own disadvantages, such as being able to obtain information only from a PC while at home and not being able to participate in community groups. Therefore, it is necessary to firmly decide how to use it (time, place, contents) on the assumption that it will be possessed. Or if you are a minor, parents may need to give guidance in advance.

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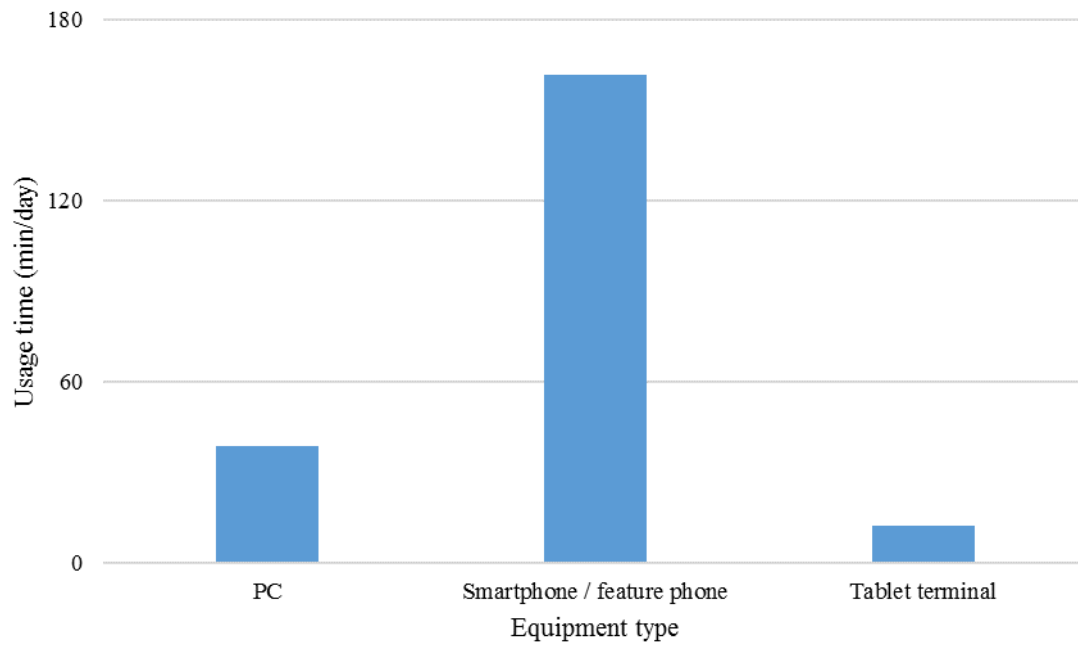


Figure No. 1: Internet usage time for each device by high school students

It is based on the data in Reference [1].

Survey is done on daily use time for men and women in high school 1-3 graders in 2013.

The graph is an average of the questionnaire results, but the possibility of using multiple devices in parallel cannot be denied.

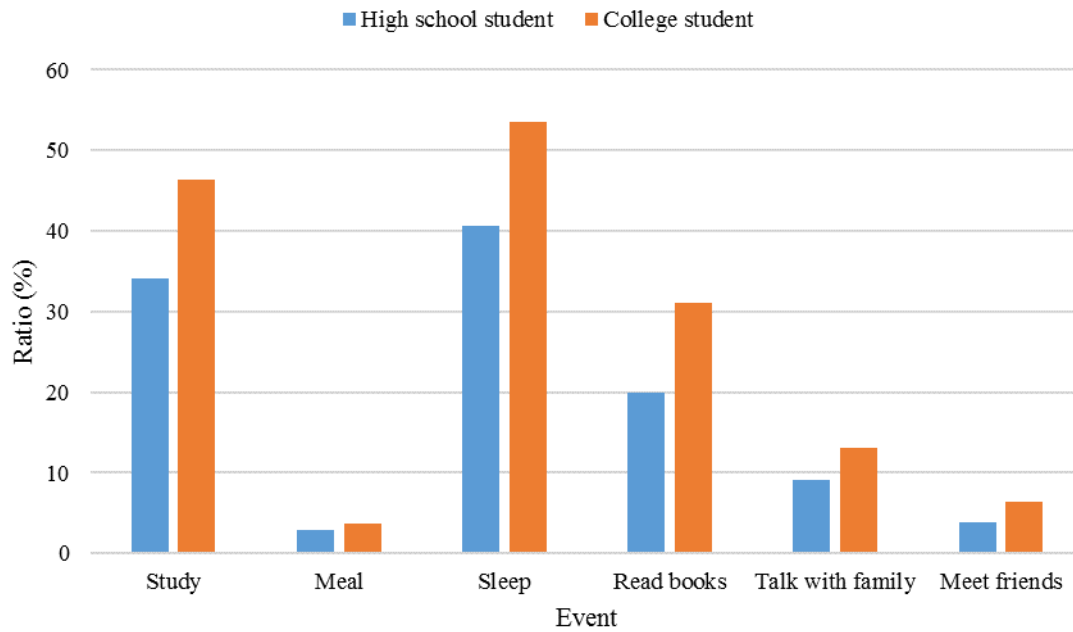


Figure No. 2: Time estimated to be reduced by using smartphones

It is based on data from References [1] (Survey of high school students) and [2] (Survey of university students).

It is done depending on the subjectivity of university students or high school students.

Categories depicted were selected based on only common contents to contrast with each other.