

The influence of modern mobile devices on the performance of medical students

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Abstract. The modern smartphones attract teachers and students with their opportunities to develop competencies with numerous applications, and at the same time, the obvious and yet insufficiently studied threats associated with smartphones cause concern and concern. Having a huge potential for use in the educational environment, the phone becomes a cause of conflict, a hindrance in lessons and a competitor to productive pastime. The paucity and inconsistency of data on the impact of the phone on academic achievement, psychological well-being, and interpersonal relationships require further research. The study among junior students of the Institute considered the issues of productive and problematic use of mobile phones. The survey method was used to obtain information about the use of a mobile phone. One of the manifestations of the construct "problematic mobile phone use" is the presence of problems in various spheres of life, including problems related to school. As a result of the study, the positive and negative effects of mobile phones on educational activities were identified.

1 Introduction

The mobile phone is an essential part of modern life. Now it is difficult to imagine that this device was available to very few two decades ago, but at the moment it has become completely accessible to all categories of the population. The capabilities of modern phones go far beyond the simple transmission of information, it has become really mobile in terms of size and multiple functions, which naturally attract a lot of attention from young people. The current younger generation are great connoisseurs of all the functions that are presented in modern mobile devices. Since a mobile phone is not a stationary type of communication, it is used everywhere.

The relevance of this work is to determine the role of the mobile phone in the life of modern students and in the educational process. According to parents and teachers, a serious obstacle to the success of students in learning is an excessive fascination with the numerous possibilities of the phone. As students and active users of cellular communication services, we consider it very important for ourselves to determine the impact of excessive phone use in the learning process. This problem is very relevant for many, so we believe that this issue requires more in-depth study.

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To study this issue, you need to solve the following tasks:

- Analyze information about the capabilities of modern mobile phones.
- Conduct a survey of teachers, students and their parents about the attitude of each of them to the use of mobile phones in the educational process;
- Conduct an experiment to identify the impact of mobile phones on academic performance among students.

The object of the study is the use of mobile phones by students.

The subject of the study is the impact of using mobile phones on students ' academic performance.

Research methods: questionnaires and comparative analysis.

Mobile phones belong to the group of communicators, among which the most popular is the smartphone. A smartphone (from the English *smartphone* — literally translated from English means "smart phone") is a phone that has its own operating system, processor, and RAM. In addition to the price and popularity, the changes also affected the technical part: if in the first years of its existence the mobile phone was a simple tool for making calls, now it is almost a full-fledged computer that fits freely in your pocket. In recent years, there has been a boom: users ' requests are growing, and manufacturers are outstripping each other every year, releasing more powerful processors, video chips, cameras, making the case thinner and the screen diagonal larger.

A smartphone differs from a regular phone in that it runs under the operating system. The most popular mobile operating systems at the moment are Android, iOS, and Windows Phone.

Also, with the development of performance, the capabilities of the smartphone also grow, they have more and more functions. Thanks to the operating system, smartphone owners have the opportunity to expand the functionality with additional applications. The widespread use of smartphones with a huge number of applications and services that expand the range of opportunities to meet various needs, the availability of a smartphone for every schoolchild and student lead to the question of the place and role of this mobile device in learning and the learning process. The multi-functionality of the smartphone provides its use as a means of operational access to information resources on the Internet, a device for communicating with other participants in the educational process, a display for displaying educational information presented in various forms (tests, media files). At the same time, a smartphone is a distracting object, a gadget that, given certain prerequisites, can become an object of forming addictive behavior (from the English *addiction* – an addiction, a vicious tendency in our case of smartphone addiction, mobile addiction) and other forms of mental disorders.

2 Methods

Research shows that having a mobile phone leads to a number of positive psychological effects, such as increased feelings of independence and autonomy. The phone provides an opportunity to establish and maintain positive relationships, to be connected with parents and friends. A number of negative consequences of excessive mobile phone use are also known: anxiety, loss of a sense of security, frequent mood changes, anxiety due to problems accessing services, feelings of isolation and abandonment if you do not receive the expected messages, sleep disorders, frequent awakenings to check for incoming messages or calls, physical symptoms (neck pain dry eyes, visual disturbances, etc., auditory and tactile hallucinations, delusions, *nomophobia* (fear of being left without a phone), etc.) [1-13].

There is evidence that even the very fact that a smartphone is turned on within easy reach (on a desk, in a bag) affects cognitive functions (memory and attention), reducing their productivity [14].

Recently, researchers have been attracted to the problem of the formation of dependence on a mobile phone (mobile addiction, smartphone addiction), the key feature of which is the inability to regulate the use of a mobile phone, which ultimately leads to negative consequences in everyday life. It should be noted that due to the relative novelty of the research issues, some of the issues around the key phenomenon of smartphone addiction remain debatable. The terminology used (mobile phone addiction, problematic or dysfunctional mobile phone use, etc.) continues to be discussed., the composition of the main components, and the reasons for the addiction (the phone itself or the content and activities offered by its apps). The very existence of addiction can also be called into question, since the symptoms associated with it are seen as a manifestation of other mental disorders [15-17].

Within the framework of the article, we focus on the concept of "problematic use", believing that it can also apply to situations related to the learning process. In this case, problems that arise due to phone use (for example, reduced academic performance, limited contact with peers, etc.) can be considered as manifestations of the phenomenon of problematic mobile phone use.

Understanding the reasons for the negative impact of the telephone on education can also contribute to the currently developed theories that are designed to explain the formation of telephone addiction. So, the theory of avoidance is based on the fact that mobile phones can be used to rid the painful self-consciousness of negative experiences and pressing problems. By focusing their attention on the "here and now", the user is protected from unpleasant thoughts and experiences related to existing problems, and thus reduces the discomfort and stress caused by stress.

A number of studies are devoted to the study of predictors of problematic phone use, such as neuroticism, extraversion, low self-esteem, and unfriendliness [2-6]. J. Bellux [3] proposed an integrative theoretical model for the formation of phone addiction, which he named *Pathway Model of Problematic Mobile Phone Use*. The author believes that three paths can lead to the formation of problematic phone use: the path of excessive need for social support (an excessive reassurance pathway), the path of impulsivity and sociality, and the path of extraversion. Each of these pathways relates to a specific set of personality traits, the most popular mobile phone apps (features), the type of problematic phone use, and behavioral symptoms.

In adolescents and young men, a mobile phone can serve as a tool for reducing the level of loneliness. The constant desire to use the phone in this case is associated with the need to obtain guarantees of acceptance and with the fear of being rejected [3].

Data on the prevalence of mobile phone addiction, including during adolescence and adulthood, is very mixed. Indicators vary very widely –from 5 to 60 %, which is explained by differences in the definition of the evaluated construct itself, in the assessment methods used and the place of conducting.

Understanding the causes of problematic phone use in schools and universities, as well as developing preventive measures, requires taking into account the gender and age differences in the manifestations of phone addiction identified by research. It was found that the time spent on a mobile phone decreases with age. The highest rates were obtained for the age group under 20 years, where adolescents aged 14 and older predominate among addicts. The revealed dynamics is explained by the weakening of self-control, which is characteristic of adolescence. It was also found that girls, compared to boys, show a greater dependence on the phone, they are characterized by the predominant use of communication services and applications that provide opportunities to establish and maintain social

connections, as well as serve to control negative emotions. Young people are distinguished by a tendency to risky use of the phone, great practicality and variety in using the phone's functions [11].

taking care of psychological well-being and providing conditions for effective study leads to the fact that the administration of educational organizations tries to limit the use of phones in the classroom and school, although many teachers recognize that the phone can be productively used in the classroom to search for information (as an alternative to less mobile tablets) and during classes outside taking a class (for example, for video and photo shooting of surveillance objects).

In France, the use of the phone at school is prohibited by law. In the UK, each school has the right to impose its own restrictions on the use of mobile phones, and bans can manifest themselves differently depending on the age of the student. For example, a 10-year-old student may be allowed to use the phone only once a week, an 11 – year-old may be allowed to use it three times, and so on. Such measures are aimed at creating a sense of responsibility and are designed to counteract the formation of dependence on a mobile phone. In one study conducted in the UK, it was found that banning the use of a phone at school among 16-year-olds increases test success by 6.4 % [1].

There are also no official bans or restrictions on using a mobile phone at school in our country. Each educational institution has the right to introduce its own restrictions, although most teachers, including the Minister of Education of the Russian Federation Vasilyeva, see it rather as a hindrance to the learning process. At the same time, you can use your phone as a tool for solving individual educational tasks.

In higher education, there are no restrictions on using a smartphone. Survey data indicates that the majority of students use the phone for educational purposes. Moreover, specialized software and applications designed to solve educational problems are being developed, for example, providing access to electronic educational resources, libraries, and materials of distance courses. The list of ways to use a mobile phone compiled by experts for one study published in 2017 [12] included: translating texts, receiving and sending messages and e-mail about independent work, reading news, solving mathematical problems, viewing presentations and drawings in disciplines, recording lectures, taking notes during classes, practicing pronunciation. search for definitions, perform tests on disciplines online, record (video and audio) lectures and presentations, view recordings on academic subjects, post and upload training materials.

With the proliferation of smartphones, publications began to appear with research reports on the effects of using smartphones in educational activities. There are data [10] indicating an increase in academic achievement among students who used electronic devices, including smartphones. At the same time, a number of studies provide data indicating the existence of negative correlations of learning success with the use of the phone by students in higher educational institutions. Thus, negative correlations of academic performance with various types of learning-related activities carried out using the phone (correspondence about studying, copying class materials, downloading presentations, etc.) were obtained for a sample of university students in Malaysia [3]. Studies conducted in the United States [7] also led to conclusions about a negative relationship between the time spent using a smartphone and students ' academic performance: the more time a student spends on a smartphone every day, the worse they perform on tests. Thus, intensive use of the phone, even for solving educational tasks, can negatively affect learning activities. Researchers attribute the explanation of the resulting dependence to the phenomenon of multitasking. The multi-functional nature of the phone and the presence of many applications inevitably create a multitasking situation that requires constant switching from one type of activity to another, including in the learning process. This leads to a deterioration in the assimilation of the material and a decrease in academic performance.

It can be stated that at the moment, the empirical material collected by researchers does not allow us to draw unambiguous conclusions about the psychological, educational and other consequences of using a smartphone in an educational environment. Our research was aimed at identifying the features of mobile phone use by high school students and students, as well as its impact on educational activities.

Participants of the study were 1,11 1-2-year students of the Ferghana Medical Institute of Public Health aged from 17 to 27 years. Respondents answered the questionnaire questions about mobile phone use and the Problematic Use of Mobile Phone (PUMP) scale, adapted by the authors of the article to study the severity of mobile phone addiction. Questions about the use of a mobile phone related to its possible negative and positive effects on the process and results of educational activities. The PUMP scale of problematic mobile phone use PUMP [8] is based on an extended model of the concept of telephone addiction, which includes, along with the symptoms common to all addictions, behavioral manifestations associated with excessive problematic phone use. The normative data obtained by the authors allow us to assign subjects to one of three assessment categories: norm, risk group, and pronounced problematic use (dependence). Data analysis was performed using the Excel statistical package. Gender and age of students were taken into account.

3 Research results

The survey revealed the presence of a smartphone in 100% of students. This ensures that most people have constant access to Internet services and applications and defines how to use the phone as a means of operational communication (messaging via social networks and instant messengers).

Based on the data obtained (Fig. 1), we predicted that most of the time spent with the phone is spent communicating on social networks, but this indicator was not confirmed (41.4%). Quite often, the phone is used as a device for listening to music (56.8,8 %), for searching for non-academic information (74.8,8 %) and video viewing (60.4%) (at the same time, respondents claimed that they watch videos by subject and this proved the importance of creating video conventions in electronic educational resources), for making phone calls (83.8,8 %). With approximately the same frequency, the smartphone serves as a means for taking videos and photos (39.6 and 45.9%). Percentages correspond to the number of respondents who spend at least one hour on this type of activity every day.

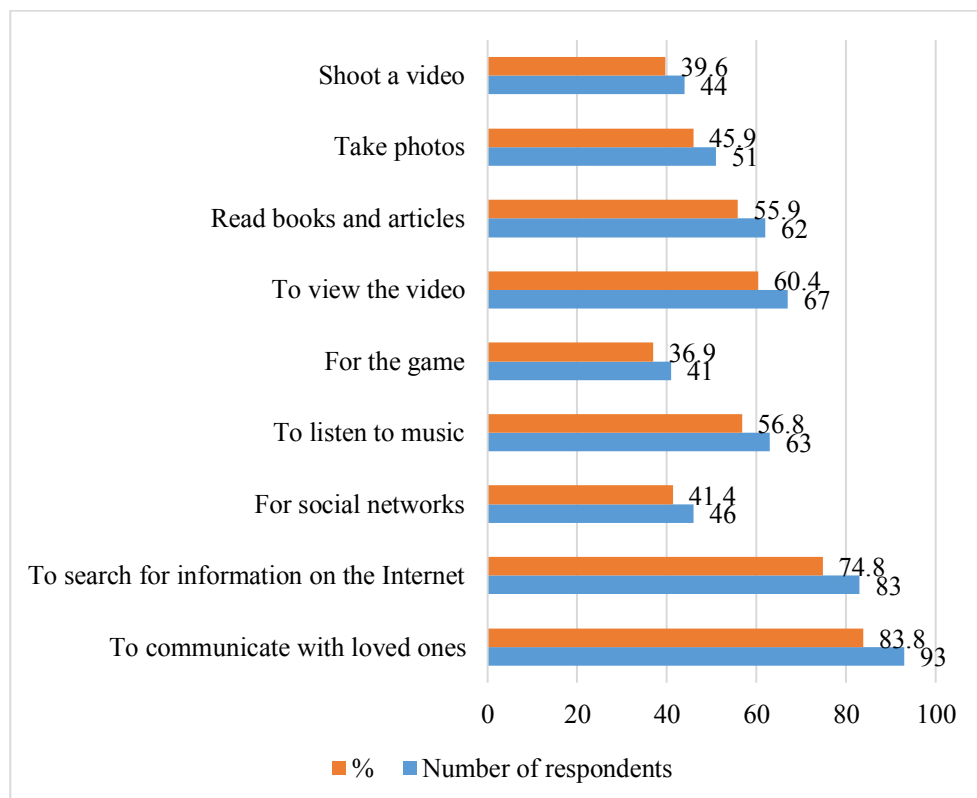


Fig. 1. Diagram of the frequency of using various smartphone services.

As for the gender characteristics of phone use, young men are less likely to make calls ($p < 0.01$), but more likely to use the phone for games ($p < 0.01$) and watching videos ($p < 0.01$).

According to the PUMP questionnaire, 2.2% of students were found to have problematic mobile phone use, while 13.1 % were classified as at risk. It was found that problematic phone use positively correlates with the time spent on the Internet ($p < 0.01$), as well as certain types of activity using a mobile phone. The strongest correlation was found with the time spent in social networks ($R_{sp} = 0.45$, $p < 0.001$) and watching video and TV ($R_{sp} = 0.25$, $p < 0.01$). At a lower level ($p < 0.05$), links were obtained with the search for information not related to school, as well as with video and photography.

Analysis of the obtained correlations, taking into account gender, leads to the conclusion that the identified associations of problematic use are characteristic, first of all, for girls. Additionally, they have a significant and fairly strong correlation with listening to music. In young men, connections of problematic use do not reach a significant level. The impact of smartphones (both positive and negative) on students' learning was assessed based on the analysis of responses to the questionnaire questions (Table 1).

Analysis of the responses showed that almost 20% of respondents agree that the smartphone takes time away from school, and another 34 % agreed with the "something in between" option, i.e. they recognized that the phone creates certain obstacles to preparing for classes at home. The presence of a smartphone distracts from working in the audience, according to 42 % of respondents, 21 % agree and fully agree, and 21 % choose an ambivalent answer. The negative impact of the phone should also be attributed to its impact

on cognitive processes–Reduced concentration of attention –is indicated (with varying degrees of agreement) by more than half of the respondents (56.9%).

Students are more likely to agree with phrases where the phone is presented as a means of communicating about their studies, and the ability to read recommended literature and view video materials on subjects. However, students use their smartphone as a stress reliever less often ($p < 0.05$).

Table 1. The impact of a smartphone on your studies.

Statement	Totally disagree (%)	Disagree (%)	Something in between (%)	Agree (%)	Totally agree (%)	Correlation with the Pump
1 scale. Takes time away from studying in the process of preparing for classes at home	22.37	23.68	34.21	13.82	5.92	0.56
2. Distracts during classes in the classroom	26.80	31.37	20.92	15.03	5.88	0.40
3. Reduces the ability to concentrate	20.92	22.22	28.10	20.92	7.84	0.52
4. Allows you to get advice from competent persons	10.46	11.76	30.72	36.60	10.46	0.14
5. Allows you to read recommended textbooks, manuals, etc	9.87	7.89	15.13	44.08	23.03	0.03
6. Provides communication about studying with classmates and teachers	3,27	1,96	8,50	43,14	43,14	0,09
7. Helps relieve stress from studying and relax	7.19	13.07	29.41	30.07	20.26	0.39
8. Provides access to information sources	3,27	1,96	3,92	39,22	51,63	0,11

All three variants of the obvious negative impact of a smartphone on learning are related to each other and positively correlate with the PUMP scale score: the more dependence is shown, the greater the degree of agreement with statements in which the smartphone is associated with interference with learning. Smartphone addiction also positively correlates with the statement that the phone helps to relieve stress from studying, i.e. it acts as a means of mental self-regulation ($p < 0.01$).

The survey allows you to draw conclusions about productive smartphone use and recognize that having a phone creates new opportunities for students: 70 % agree that the phone allows you to use educational literature and resources, 47 % - to get advice, and 80 % - to communicate about their studies. It seems that the smartphone for students is really a tool that helps in their studies. The obtained correlations with the PUMP scale indicate that the reason for the negative impact may be the formed dependence on the smartphone.

The data obtained also allow us to assess the relationship between learning success and using a smartphone. As it turned out, academic performance is not related to how much time the student spends with the phone. A weak negative correlation was obtained only with the time of listening to music ($p < 0.05$). The coefficients of rank correlation of academic performance with other types of activity using the phone turned out to be close to zero.

It was also found that academic performance is related to how much the phone distracts from studying at home or during classes in the classroom ($p < 0.05$). Teachers with high scores are less likely to consider the phone as a hindrance to studying in the walls of an educational institution or while preparing homework.

4 Conclusion

Summarizing the data obtained in the study, it can be argued that the impact of the phone on students' learning activities cannot be assessed unambiguously: there are positive effects and negative effects. The study shows that the problematic use of the phone by students, which hinders the achievement of educational tasks and reduces the productivity of learning, is a consequence of the formed dependence. The proposed model suggests that individual personality traits may serve as psychological prerequisites for the formation of addiction. It can be assumed that the age of the beginning of active mobile phone use is a predictor of the possible formation of problematic mobile phone use and its main components. The mobile phone is a unique way of coping with traditional problems of adolescence, performing a specific psychological protective function. Such problematic use of a mobile phone in adolescence is rather situational, and as the smartphone matures, it finds its true functional purpose, which does not exclude the initiation of appropriate joint preventive and preventive measures.

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