Study of Mobile Phone Use by Pupils of Primary Schools in the Region of Košice

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Abstract: Within the study of environmental quality assessment conducted by the Department of Environmental Sciences at Faculty of Mechanical Engineering of Technical University of Košice, we decided to start a new study which is aimed at scrutinizing a mobile phone expansion, purpose and frequency of their use by the students of primary schools, secondary schools and universities in the Slovak Republic. Since almost each child owns a mobile phone and according to different surveys conducted by the agency GFK Slovakia 9 out of 10 teenagers use mobile phone, we decided to represent this part of population in our contribution. This group of people is in terms of impact on health at highest risk. All present results of the research done on 510 students will be presented in this article.

Keywords: Mobile Phones; Health; Health Risks

1   Introduction

Although the issue of the effects of electromagnetic field (EMF) on live organisms has been intensively studied for more than 40 years, no definite impacts and effects of this field have been discovered yet. [1] Proving the negative effects would have an impact on life of a young individual, who is exposed to electromagnetic fields of different frequencies and intensities every day. [2] [3] Today mainly (WHO) World Health Organisation and (ICNIRP) International Commission on Non‑Ionizing Radiation Protection [29] deal with the impact of EMF. These organisations determined that electric devices must meet specific requirements and must be electromagnetically compatible in order to be used in practice without any threat to human health. [5] [6] [7]

1.1 Effects of Radiation Emitted by Mobile Phones

Use of mobile phones in Europe is connected with the development of digital networks GSM (Global System for Mobile Communications) in early 80s of 20th century. [7]

1.1.1 Epidemiologic Studies

Extension of mobile phones provoked (WHO) World Health Organisation into posing the question whether EMFs emitted during the running of these devices damages organisms of their users in any way. [4] [9] [10] [11] [12] [13] [14] [15] The highest risk of possible health damage stems from the fact that the principle of mobile phone functioning is based on emitting electromagnetic energy. This claim is supported by the fact that when one uses a mobile phone, it is situated near the head, which eventually causes that most emitted electromagnetic energy penetrates the brain of the caller. [1] Excessive absorption might cause higher temperature in fibres such as those in brain [16] [17] [18] and thus negatively influence functioning of these fibres and organs in this area. [12] [13] [14] [15] Because of these reasons, considerable amount of studies was aimed exactly at finding the association between mobile phone use and possible creation of brain tumors. Others looked for the connection between calling and tiredness, headache and burning sensation in the ear and skin immediately after calling.

From 1982 to 1995, the Danish company published a study in which the connection between mobile phone use and creation of brain tumours was denied. This study monitored the time period of 5 years (1998-2003). At that time, the increase of mobile communication was the highest. [15] Later, in the year 2006, the supranational study Interphone was conducted. 16 departments from 13 countries of the world (Australia, Canada, Denmark, Finland, France, Germany, Israel, Italy, Japan, New Zealand, Norway, Sweden and the UK [30]) participated in this study. Interphone focused on 30- to 59-year-olds based on the assumption that it would be this group of people who would reach the highest prevalence of mobile phones use in the past 5 to 10 years. The study revealed that the increased development of brain tumours might be associated with the use of mobile phones. [20] [21] [22] [24] Unlike this study, a Swedish group of scientists started a research which was based on questionnaires. These were sent to a group of people who were randomly generated from the lists of mobile operators. 12.000 questionnaires were sent and based on their analysis, the researchers revealed that the burning sensation in the ear could be observed already at the time of calling. Other symptoms such as headache appeared within 1,5 hour´s time after the call and lasted for 2 hours. [23] In the year 2007, a new research conducted by The Swedish National Institute of Public Health was published. The study was led by Hansson Mild on 4.400 people and the results showed that people who used their cell phones reguralry during the period of 10 years for approximately 1 hour a day had 240% greater risk for malignant brain tumors. [25] [26] [27] From other

studies we will mention an American study in the areas of Boston, Chicago, Dallas and Washington in 1996. In the years 2000-2002, researchers monitored the creation of tumours; the resulsts were ambiguous. In 2002 in Finland, no direct correlation between tumours and cell phone use was found. [28] Many studies conducted in the last two decades considered whether mobile phones pose a potential health risk or not. However, no negative effects of cell phone use have been proved yet.

2   Research Methods

Mobile phones have found their way to each of us, children being no exception. Many times, they get their first cell phone as soon as they start school, sometimes even earlier. Often, the reason is the effort of parents to be in contact with their children when they are apart. Almost half of children have their own mobile phones at the end of the first stage of elementary education. However, parents often forget the fact that experts do not recommend mobile phone use by children. William Steward from The National Radiological Protection Board claims that although there is no direct proof of harmfulness of these devices, parents should not buy them to children under 8 years old. "If there is a certain risk, and we really do think there is some, then mainly small children will suffer. The younger the children are, the higher the risk is." Based on the preliminary results, signal from the device can cause certain biological changes in children in specific cases. William Steward supports his claims by explaining that children´s skull is thinner and their brain still develops. On the other hand, WHO claims that no correlation between health damage and the electromagnetic field of cell phones have been proved until now. **At the same time, it asserts that mobiles have been used for only a relatively short time and more researches are needed.**

Therefore, the Department of Environmental Sciences at Faculty of Mechanical Engineering of Technical University of Košice decided to start a study aimed at scrutinizing a mobile phone expansion, and purpose and frequency of cell phone use by the students of primary schools in the region of Košice. Since mobile phones are already used by 4-year-old children, and they have become an inseparable part of everyday life of two thirds of children from 9 to 11 years old and almost all older children up to 15 years old, [9] these groups of people face higher health damage risk and thus became the basis for our research. We base on the idea that all the defined effects on physical human health are rather speculations (they are not proved − the results of different studies oppose one another), but, on the other hand, effects on mental health (such as depression, anxiety, addiction etc.) are more probable. Consequently, the aim of the study was to collect relevant information about the effects of cell phones on human behaviour, mainly that of youth, and prove their impact on mental health.

The pilot study of mobile phone use was realized from November 2012 to January 2013. Subjects of the research were pupils of the second stage of primary schools in region of Košice. The study took place in towns Michalovce and Košice. 510 pupils aged from 10 to 15 years old participated in the pilot study (Table 1). The sample for the study was represented by 260 boys (51%) and 250 girls (49%). Respondents were divided into three categories according to their age: from 10 to 11, from 12 to 13 and from 14 to 15 years old. The average age of the respondents was 13. There were 92 pupils **(18.1%)** in the category from 10 to 11 years old, 169 pupils **(33.1%)** in the category from 12 to 13 years old and 249 pupils **(48.8%)** in the largest category from 14 to 15 years old.

Table 1
Basic information about the pupils

Age category	Gender				Total	
	Boys		Girls			
	n	%	n	%	n	%
10-11	38	35.9	54	64.1	92	100
12-13	88	52.1	81	47.9	169	100
14-15	134	53.8	115	46.2	249	100
Total	260	51.0	250	49.0	510	100

2.1   Five Basic Sections of the Study

The criteria which were taken into account when evaluating the research were the differences between boys and girls and differences among chosen age categories as well. We analysed the individual results according to individual answers to the question in the questionnaire. The questions were divided into five basic sections (Appendix A – general part, Appendix B – purpose of mobile phone use, Appendix C – frequency of mobile phone use, Appendix D – awareness of impact of mobile phones on human health, Appendix E – dependence on mobile phone use). For clarification below we list the complete text of the questions of the questionnaire (Appendix A - Appendix E).

Appendix A

General part

Q1.A Respondent´s sex
Q2.A Respondent´s age
Q3.A Do you use mobile phone?
Q4.A Whose mobile phone do you use?
Q5.A How old is a mobile phone you use?

Appendix B

Purpose of mobile phone use

Q1.B I use a mobile phone to call my family (parents, siblings etc.)

Q2.B I use a mobile phone to call my friends, classmates.
Q3.B I use a mobile phone for playing games on the Internet.
Q4.B I use a mobile phone to communicate with my friends on social networks.
Q5.B I use a mobile phone to send SMS and MMS.
Q6.B I use a mobile phone for other purposes.

Appendix C

Frequency of mobile phone use

Q1.C Estimate the time you spend making calls each day.
Q2.C Estimate the average length of your calls.
Q3.C Estimate how many 10 minutes or longer calls you make per month.
Q4.C Estimate the time you spend using the Internet on your phone each day.
Q5.C How long have you been using a mobile phone?

Appendix D

Awareness of impact of mobile phones on human health

Q1.D Do you have your mobile phone turned on near your bed when you sleep?
Q2.D Do you think that your mobile phone might have any negative impact on your health?
Q3.D If scientists proved negative impacts of mobile phones on human health, would you limit their use?
Q4.D Would you like to gain more information about possible risks of mobile phone use?

Appendix E

Mobile phone dependence

Q1.E Do you ever turn your mobile phone off?
Q2.E How do you feel when you cannot communicate through mobile phone?
Q3.E Do you think that one can be dependent on mobile phone?

3   Results and Discussion

The whole study was divided into two phases. In the first phases, we conducted the questionnaire survey which was divided among students of three age categories: from 10 to 15 years old, from 15 to 18 years old and from 18 to 25 years old. The second phase will be aimed at physically and psychically working people. **We will present actual results of the study conducted on 510 respondents in the age category from 10 to 15 year old in this article.** As authors of the questionnaire we tried to pursue the relation between the questions and aims of the study during drafting the questionnaire. Questionnaire method of evaluation was adequate mainly because no personal contact with each respondent was required and enough data was collected. We used pivot tables to process the collected data, which enabled us to gain needed information from vast data sets. We can order these data in different ways compare and summarize them, and we are able to separate meaningful and important information. Besides a simple

description of the frequency of combinations of values of two variables, these pivot tables offer the possibility of testing correlation between the two variables. In this stage we used Chi‑Square Test for Independence, Pearson´s product‑moment correlation coefficient and phi coefficient.

3.1   General Part „Appendix A"

Q3.A: Do you use mobile phone?

As many as 492 pupils **(96.5%)** declared that they use mobile phone. 18 pupils **(3.5%)**, 8 boys and 10 girls, answered that they do not use mobile phone at all. See Table 2**. In the next part of evaluation we will work with the sample of 492 respondents; 252 boys (51.2%) and 240 girls (48.8%).**

Q4.A: Whose mobile phone do you use?

Recently, Research Institute for Child Psychology and Pathopsychology in Bratislava has conducted a research focused on the primary schools pupils as well. Their aim was to investigate pupils´ experience with virtual space and access to a mobile phone. Their research sample (518 pupils, 281 boys and 236 girls) composed of approximately the same number of respondents as ours. The results from both studies suggest that there is almost no difference in what type of mobile phone the pupils use among different areas of Slovakia. The total number of pupils who own a mobile phone in Eastern Slovakia is approximately 1% higher than the numbers in Central and Western Slovakia. After comparing the results we came to the conclusion that 468 pupils in the east **(95.1%)** possess their own mobile phone. It is a little less than 90%, precisely **89.7%,** in the west. The numbers of the rest of pupils, i.e. those who use their parents´ or someone elses´s mobile phone, do not differ very much throughout Slovakia; they all are approximately **(5.0%).** See Table 2. Our research shows that as many as 241 pupils **(98%)** aged 14 – 15 use their own mobile phone. The other 227 pupils who use their own mobile phone fall into age categories 10 – 11 and 12 – 13 years old. By means of **Chi-Square Test for Independence** we wanted to determine whether the variables *"Respondents´ sex"*, or *"Age category"*, and *"Q4.A – What mobile phone do you use (Do you have your own or somebody else´s phone)?"* are independent. The results show that the variables *"Respondents´ sex"* and *"Q4.A"* (p‑value=0. 487) **are independent**. On the other hand, the variables *"Age category"* and *"Q4.A" (p*‑value=0.007) **are not independent**. To assess the degree of dependence, we used these contingency rates: Pearson's contingency coefficient and Phi coefficientΦ. The calculated values of the coefficients show that the dependence is low (P=0.14, Φ=0.14).

Q5.A: How old is a mobile phone you use?

273 pupils **(55.5%)** have a new mobile phone; a mobile phones of 173 of them **(35.2%)** might be about 2 years old and a mobile phones of 46 pupils **(9.3%)**

might be older than 2 years. See Table 2. An overview of how the pupils from the individual age categories use their mobile phones considering its age (new, not older than 2 years, older than 2 years) is shown in Figure 1.
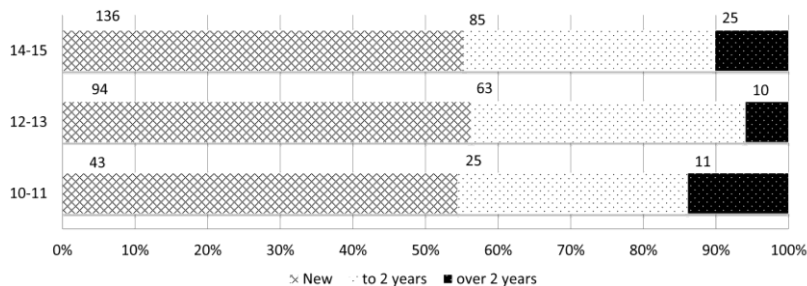

Figure 1

Overview of age categories with respect to "Q5.A"

By means of **Chi-Square Test for Independence** we wanted to determine whether the variables *"Respondents´ sex"*, or *"Age category"*, and *"Q5.A"* are independent. The results show that the variables *"Respondents´ sex"* and *"Q5.A"* (p-value=0.683) **are independent**. The variables *"Age category"* and *"Q5.A"* (p-value=0.329) **are independent as well**.

Table 2

General part – Appendix A

Question Appendix A	Scale	Gender				Total	
		Boys		Girls			
		n	%	n	%	n	%
Q1.A	yes	252	51.2	240	48.8	492	100
	no	8	44.4	10	55.6	18	100
Q4.A	own	238	50.9	230	49.1	468	100
	someone else´s	14	58.3	10	41.7	24	100
Q5.A	new	144	52.7	129	47.3	273	100
	not older than 2 years	84	48.6	89	51.4	173	100
	older than 2 years	24	52.2	22	47.8	46	100

3.2   Purpose of Mobile Phone Use „Appendix B"

Ownership of a mobile phone is for children in primary schools almost a matter of course; it is a matter of prestige. They use their mobile phones not only for making calls, sending SMS and MMS, but for other activities such as listening to music, playing games, taking photos, recording and watching videos as well. In the next part of the study we were concerned about the purpose of mobile phone use. As many as 375 pupils **(76.2%)** stated that they use their mobile phones in

order to be able to call their families. 339 out of 492 pupils **(68.9%)** stated that they use their mobile phones for making calls with their friends. The research shows that only 132 pupils **(26.8%)** use their mobile phones for playing games on the Internet. Cell phones are used for communication with friends on social networks by 183 pupils **(37.2%)**. Approximately half of pupils, i.e. 215 pupils **(43.7%)**, use their cell phones for writing and sending SMS and MMS. Only 85 pupils **(17.3%)** use their mobile phones for other purposes (e.g. listening to music, taking photos, watching videos etc.). The results of our research show that primary school pupils use their mobile phones mainly for making calls with their families. Making calls with friends, sending SMS and MMS, communication on social networks, playing games on the Internet, listening to music, taking photos and watching videos follow in this order. See Table 3. Division based on age categories is shown in Figure 2.
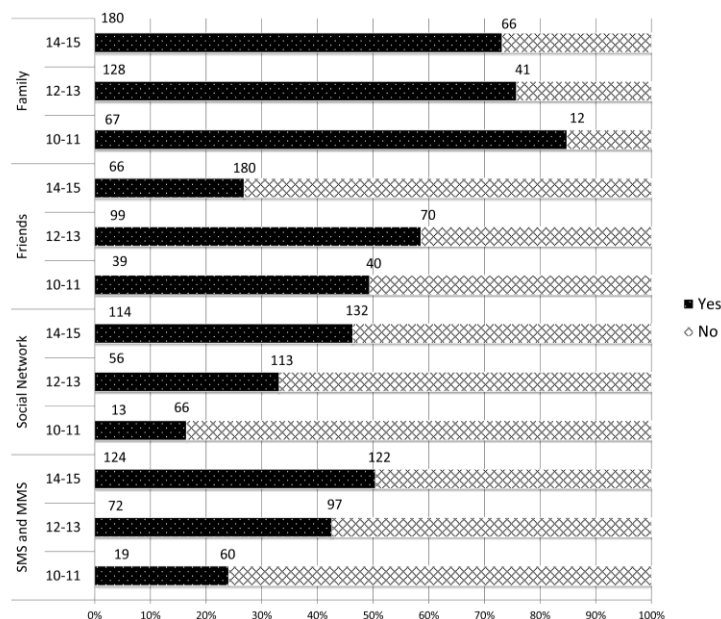

Figure 2

Overview of age categories with respect to "Q1.B – Q6.B"

Table 3

Purpose of mobile phone use

Purpose of use	Gender				Total	
	Boys		Girls			
	n	%	n	%	n	%
Q1.B	179	47.7	196	52.3	375	100
Q2.B	146	43.1	193	56.9	339	100

Q3.B	89	67.4	43	32.6	132	100
Q4.B	87	47.5	96	52.5	183	100
Q5.B	86	40.0	129	60.0	215	100
Q6.B	35	41.2	50	58.8	85	100

Chi-Square Test for Independence shows that the variables *"Respondents´ sex"* and *"Q1.B"* (p-value=0.006) **are not independent.** To assess the degree of dependence, we used these contingency rates: Pearson's contingency coefficient and Phi coefficient Φ. The calculated values of the coefficients show that the dependence is low (P=0.12, Φ=0.13). On the other hand, the variables *"Age category"* and *"Q1.B"* (p-value=0.106) **are independent**. By analogy, we wanted to determine whether the variables *"Respondents´ sex"*, or *"Age category"*, and *"Q2.B – Q6.B"* are independent. The analysis shows that the variables *"Respondents´ sex"* and "Q2.B" (p-value=0.002), *"Q3.B"* (p-value<0.0001), *"Q5.B"* (p-value<0.0001) **are not independent**. The variables *"Age category" and "Q2.B"* (p-value<0.0001), *"Q4.B"* (p-value<0.0001), *"Q5.B"* (p-value<0.0001) and *"Q6.B"* (p-value<0.034) **are not independent as well**. Values gained by Chi-Square Test for Independence and contingency coefficients are presented in the following Table 4.

Table 4

Results of Chi-Square Test for Independence of the observed variables – Appendix B

	Type	**Q1.B**	**Q2.B**	**Q3.B**	**Q4.B**	**Q5.B**	**Q6.B**
Sex	**Chi-Square Test**	7.671	9.507	18.960	1.578	19.239	4.148
	p-value	0.006	0.002	<0.0001	0.209	<0.0001	0.05
	Coefficient Phi	0.12 (0.13)	0.14 (0.14)	0.19 (0.20)	–	0.19 (0.20)	–
Age Category	**Chi-Square Test**	4.495	17.209	5.657	24.314	16.918	6.761
	p-value	0.106	<0.0001	0.059	<0.0001	<0.0001	0.034
	Coefficient Phi	–	0.18 (0.19)	–	0.22 (0.22)	0.18 (0.18)	0.12 (0.12)

3.3   Frequency of Mobile Phone Use „Appendix C"

Q1.C: Estimate the time you spend making calls each day.

As many as 340 pupils **(69.1%)** use their cell phones for making shorter than 10‑minute‑long calls each day. 115 pupils **(23.4%)** make daily calls lasting from 10 to 30 minutes. Only 37 pupils **(7.5%)** make daily calls lasting approximately 60 minutes. Time which the primary school pupils spend making calls is presented in Figure 3. By means of **Chi-Square Test for Independence** we wanted to determine whether the variables *"Respondents´ sex"*, or *"Age category"*, and *"Q1.C"* are independent. The results show that the variables *"Respondents´ sex"*

and *"Q1.C"* (p-value=0.086) **are independent**. On the other hand, the variables *"Age category"* and *"Q1.C"* (p-value=0.013) **are not independent**. The calculated values of the contingency coefficients show that the dependence is low (P=0.16, Φ=0.16).
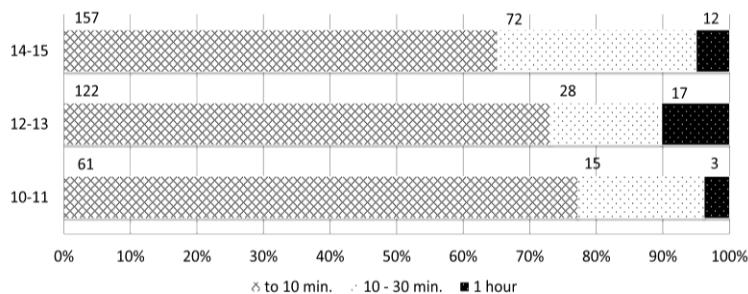

Figure 3
Overview of age categories with respect to "Q1.C"

Q2.C: Estimate the average length of your calls

207 interviewed pupils **(42.1%)** state that the average length of a call is between 1 – 3 minutes. 93 pupils **(18.9%)** make calls which last shorter than 1 minute and 41 pupils **(8.3%)** make phone calls longer than 10 minutes. The length of call between 3 – 5 minutes is stated 99 pupils **(20.1%)** and the length between 5 – 10 minutes by 52 pupils **(10.6%)** See Table 5. Detailed overview of call lengths with respect to individual age categories is shown in Figure 4. By means of **Chi-Square Test for Independence** we wanted to determine whether the variables *"Respondents´ sex"*, or *"Age category"*, and *"Q2.C"* are independent. The results show that the variables *"Respondents´ sex"* and *"Q2.C"* (p-value=0.259) **are independent**. The variables *"Age category"* and *"Q2.C"* (p-value=0.441) **are independent as well**.
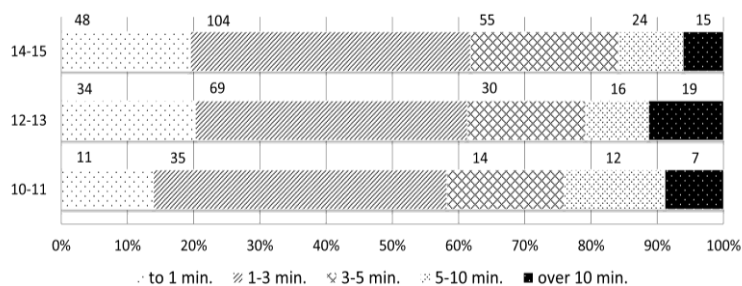

Figure 4
Overview of age categories with respect to "Q2.C"

Q3.C: Estimate how many 10 minutes or longer calls you make per month.

The gained data show that as many as 153 pupils **(31.1%)** make not even one call lasting more than 10 minutes. One ten‑minute‑call is made by 54 pupils **(11.0%)** and the same number of pupils makes a phone call lasting longer than 10 minutes. 22 pupils **(4.5%)** make more than 15 phone calls lasting more than 10 minutes. See Table 5. The results of the **Chi-Square Test for Independence** show that the variables *"Respondents´ sex"* and *"Q3.C"* (p-value=0.276) **are independent**. The variables *"Age category"* and "*Q3.C*" (p-value=0.002) **are not independent.** The calculated values of the contingency coefficients show that the dependence is low (P=0.23, Φ=0.24).

Q4.C: Estimate the time you spend using the Internet on your phone each day.

According to the survey conducted by the company Orange Slovakia in 2012 the number of children using the Internet in their mobile phones increased. The amount of children who are endangered by cell phones´ negative effects thus increased correspondingly. Almost every other child chats on social networks and almost all older children use chats regularly. At the same time, the survey showed that 80% of 12-15 year old teenagers use the Internet every day. Therefore, it is very important to educate children and talk to them about the negative effects of the web. After posing the question "*Estimate the time you spend using the Internet on your phone each day."*, 184 interviewed pupils **(37.4%)** claimed they never use the Internet on their mobile phone. 33 of them **(41.8%)** fall within the age category from 10-11 year old, 67 pupils **(40.1%)** are 12-13 year old and 84 pupils **(34.1%)** are from the oldest age category, i.e. 14-15 year old. 57 interviewed pupils use the Internet shorter than 10 minutes every day. 79 pupils use the Internet between 10-30 minutes each day. 20 pupils **(25.3%)** are aged 10-11, 24 pupils (**14.4%**) are aged 12-13 and 35 pupils are aged 14-15. 71 pupils use the mobile Internet for roughly 1 hour each day. 50 pupils use it in the range of 2 to 3 hours and approximately the same amount of pupils (51 pupils) spend more than 3 hours using the Internet every day. 33 out of these 51 pupils are aged 14-15 years old. See Table 5. The results of the **Chi-Square Test for Independence** show that the variables *"Respondents´ sex"* and *"Q4.C"* (p‑value<0.0001) **are not independent**. The variables *"Age category"* and "*Q4.C*" (p-value=0.059) **are independent.** The calculated values of the contingency coefficients show that the dependence is low (P=0.23, Φ=0.23).

Q5.C: How long have you been using a mobile phone?

Data gained from the respondents show that only 42 pupils have been using their phones for less than 1 year. 82 pupils have been using their phones between 1-2 years. 23 pupils **(29.1%)** are aged 10-11 years, 40 pupils **(24.0%)** are aged 12-13 years and 19 (**7.7%**) pupils are from the age category 14-15 year old. 125 pupils have been using their cell phones between 2-4 years and approximately the same amount, 124 pupils, have been using their mobile phones between 4-6 years. The

largest representation is in the age category 14-15 years old, in which as many as 86 pupils have been using their mobile phones between 4-6 years. The largest representation of pupils who have been using their mobile phones between 2-4 years, i.e. 57 pupils, is in the age category 12-13 year old. 77 pupils have been using their mobile phones between 6-8 years and 42 pupils have been using this device for more than 8 years. 8 out of these 42 pupils are 12-13 years old. It follows that 8 respondents have been using their mobile phones since they were 4 years old. See Table 5. Detailed overview of mobile phone use with respect to respondents´ age is shown in Figure 5.
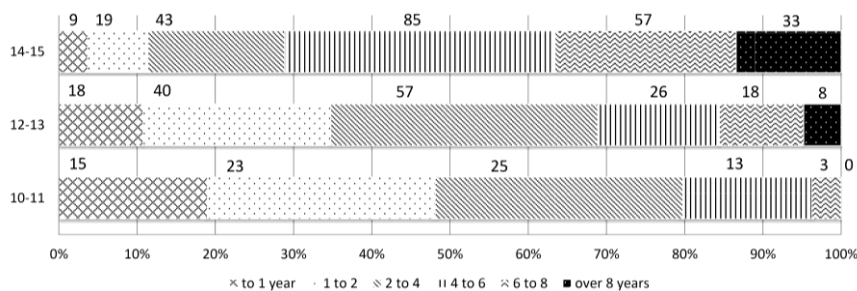

Figure 5

Overview of age categories with respect to "Q5.C"

The results of the **Chi-Square Test for Independence** show that the variables *"Respondents´ sex"* and *"Q5.C"* (p-value=0.003) **are not independent**. The variables *"Age category"* and "*Q5.C*"(p-value<0.0001) **are not independent as well.** The calculated values of the contingency coefficients show that the dependence is medium (P=0.37, Φ=0.40).

Table 5

Time period of mobile phone use – Appendix C

Question Appendix C	Scale	Gender				Total	
		Boys		Girls			
		n	%	n	%	n	%
	to10 min.	**185**	54.4	**155**	45.6	**340**	100
Q1.C	between 10-30 min.	**49**	42.6	**66**	57.4	**115**	100
	60 min.	**18**	48.6	**19**	51.4	**37**	100
	to 1 min.	**64**	68.8	**29**	31.2	**93**	100
	between 1-3 min.	**119**	57.5	**88**	42.5	**207**	100
Q2.C	between 3-5 min.	**37**	37.4	**62**	62.6	**99**	100
	between 5-10 min.	**17**	32.7	**35**	67.3	**52**	100
	more than 10 min.	**15**	36.6	**26**	63.4	**41**	100

Q3.C	to 5	**207**	58.1	**149**	41.9	**356**	100
	6 – 10	**28**	38.4	**45**	61.6	**73**	100
	11–15	**11**	26.8	**30**	73.2	**41**	100
	16 and more	**6**	27.3	**16**	72.7	**22**	100
Q4.C	to 10 min.	**34**	59.6	**23**	40.4	**57**	100
	between 10-30 min.	**42**	53.2	**37**	46.8	**79**	100
	1 hour	**39**	54.9	**32**	45.1	**71**	100
	between 2-3 hour a day	**24**	48.0	**26**	52.0	**50**	100
	more than 3 hours	**19**	37.3	**32**	62.7	**51**	100
	I do not use	**94**	51.1	**90**	48.9	**184**	100
Q5.C	less than 1 year	**30**	71.4	**12**	28.6	**42**	100
	1 - 2 years	**50**	61.0	**32**	39.0	**82**	100
	2 - 4 years	**59**	47.2	**66**	52.8	**125**	100
	4 - 6 years	**55**	44.4	**69**	55.6	**124**	100
	6 - 8 years	**43**	55.8	**34**	44.2	**77**	100
	more than 8 years	**15**	35.7	**27**	64.3	**42**	100

3.4 Awareness of Impact of Mobile Phones on Human Health „Appendix D"

The fourth section was connected with awareness of the effects of mobile phones on human health.

Q1.D: Do you have your mobile phone turned on near your bed when you sleep?

Nowadays, a mobile phone is often thought of as a device which we necessarily need to have with us at all times. For this reason, every night, as many as 358 pupils **(72.8%)** fall asleep near a mobile phone which is turned on. The most convenient place for setting it near the bed is probably a bedside table, the person´s head thus being only 50 centimetres far from the potential source of electromagnetic field. Most pupils (197) who have their cell phones near their beds are 14-15 years old, and the fewest pupils (39) sleeping with their mobile phones near their beds are from the youngest age category, i.e. aged 10-11 years old. See Table 6. The results of the **Chi-Square Test for Independence** show that the variables *"Respondents´ sex"* and *"Q1.D"* (p-value=0.632) **are independent**. On the other hand, the variables *"Age category"* and "*Q1.D"* (p-value<0.0001) **are not independent.**

Q2.D: Do you think that your mobile phone might have any negative impact on your health?

213 pupils **(43.3%)** agree that mobile phone might have some negative impact on human health. 146 pupils **(29.7%)** claim that mobile phones have no negative effects on human health and 133 pupils **(33.0%)** could not answer this question. See Table 6. The results of the **Chi-Square Test for Independence** show that the variables *"Respondents´ sex"* and *"Q2.D"* (p‑value=0.020) **are not independent**. The calculated values of the contingency coefficients show that the dependence is low (P=0.13, Φ=0.14). The variables *"Age category"* and "*Q2.D"* (p‑value=0.231) **are independent.**

Q3.D: If scientists proved negative impacts of mobile phones on human health, would you limit their use?

The assessment of the questionnaire further shows that as many as 295 pupils would not limit mobile phone use even if scientists proved negative impact of this device on human health. Answer to this question reflects individual approach of each respondent to the given issue. It is obvious that primary school pupils have not realized the value of their health yet and thus almost 60% of respondents would not limit mobile phone use even if the negative effects were proved. 33 pupils **(41.8%)** aged 10-11 years old stated that even if the negative impact was proved, they would not use their phones less. 109 pupils **(65.3%)** aged 12-13 and 153 pupils **(62.2%)** aged 14-15 years old share the same opinion. See Table 6. The results of the **Chi-Square Test for Independence** show that the variables *"Respondents´ sex"* and *"Q3.D"* (p‑value=0.868) **are independent**. On the other hand, the variables *"Age category"* and "*Q3.D"* (p‑value=0.001) **are not independent.**

Q4.D: Would you like to gain more information about possible risks of mobile phone use?

266 pupils **(54.1%)** would like to gain more information about possible health risks. Out of 266, it is 53 pupils aged 10-11 years old, 84 pupils aged 12-13 years old and 129 pupils **(52.4%)** aged 14-15 years old. See Table 6. The results of the **Chi-Square Test for Independence** show that the variables *"Respondents´ sex"* and *"Q4.D"* (p‑value=0.891) **are independent**. On the other hand, the variables *"Age category"* and "*Q4.D"* (p‑value=0.037) **are not independent.** The calculated values of the contingency coefficients show that the dependence is low (P=0.12, Φ=0.12).

Table 6

Effects of mobile phone use on human health – Appendix D

Question Appendix D	Scale	Gender				Total	
		Boys		Girls			
		n	%	n	%	n	%

Q1.D	yes	**181**	50.6	**177**	49.4	**358**	100
	no	**71**	53.0	**63**	47.0	**134**	100
	yes	**113**	53.1	**100**	46.9	**213**	100
Q2.D	no	**84**	57.5	**62**	42.5	**146**	100
	I do not know	**55**	41.4	**78**	58.6	**133**	100
Q3.D	yes	**100**	50.8	**97**	49.2	**197**	100
	no	**152**	51.5	**143**	48.5	**295**	100
Q4.D	yes	**137**	51.5	**129**	48.5	**266**	100
	no	**115**	50.9	**111**	49.1	**226**	100

3.5   Mobile Phone Dependence „Appendix E"

According to psychologists, new communication technologies are becoming another threat of our society. Writing short messages can turn into pathological dependence. These and other technologies tempt people to break away from reality and live in their own virtual world. According to the survey conducted by the company Orange Slovakia, every fourth child is endangered by dependence on activities linked to computer or the Internet connection. For these reasons we were interested in pupils´ attitude to *"mobile phone dependence"* in the fifth section.

Q1.E: Do you ever turn your mobile phone off?

109 pupils **(22.2%)** answered that they turn their mobile phone off, 235 pupils **(47.8%)** answered that they seldom turn it off and 148 pupils **(28.3%)** never turn it off. See Table 7. The results of the **Chi-Square Test for Independence** show that the variables *"Respondents´ sex"* and *"Q1.E"* (p-value=0.450) **are independent**. The variables *"Age category"* and "*Q1.E"* (p-value=0.024) **are not independent.** The calculated values of the contingency coefficients show that the dependence is low (P=0.15, Φ=0.15).

Q2.E: How do you feel when you cannot communicate through mobile phone?

The results show that as many as 239 pupils **(48.6%)** do not mind if they cannot communicate through their mobile phone. See Table 7. 161 pupils **(32.7%)** feel nervous because they are not able to answer a call, and only 16 pupils state **(3.3%)** that they do not feel comfortable and are not able to focus. 76 pupils **(15.4%)** try to solve this situation.
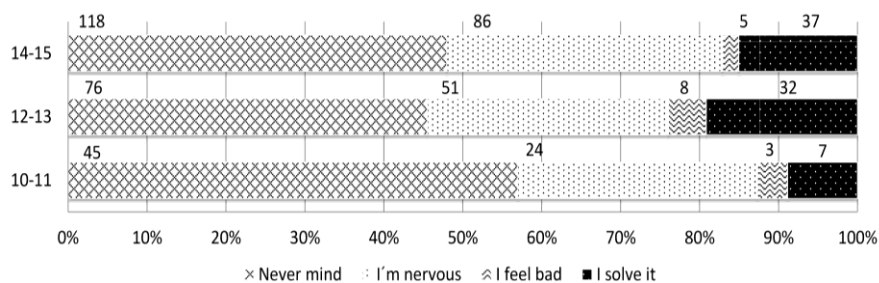
Figure 6
Overview of age categories with respect to "Q2.E"

The results of the **Chi-Square Test for Independence** show that the variables *"Respondents´ sex"* and *"Q2.E"* (p-value<0.0001) **are not independent**. The calculated values of the contingency coefficients show that the dependence is low (P=0.27, Φ=0.28). The variables *"Age category"* and "*Q2.E*" (p-value=0.211) **are independent.**

Q3.E: Do you think that one can be dependent on mobile phone?

As many as 384 pupils **(78%)** think that one can be dependent on mobile phone. Only 69 pupils **(14.1%)** provide a negative answer and 39 pupils **(7.9%)** could not answer the question. See Figure 7.
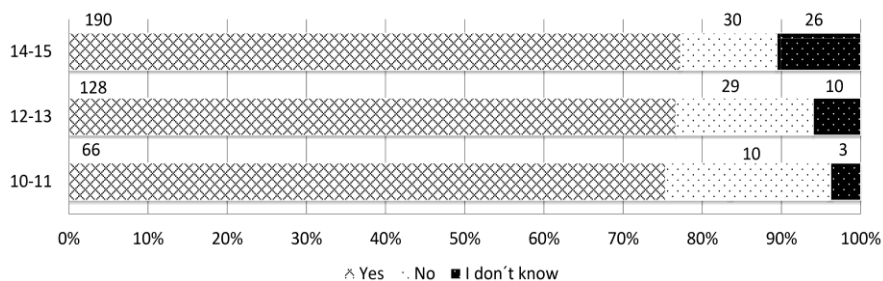

Figure 7
Overview of age categories with respect to "Q3.E"

It follows that with the increasing age of the respondents the number of positive answers increases as well. There are two possible explanations for this. Either the dependence on mobile phone increases along with the increasing age or the individual better realizes (or understands) the significance of a mobile phone in his or her life along with the increasing age. However, if one creates a habit of using mobile phone, it does not necessarily mean that this will lead to the development of addiction. The results of the **Chi-Square Test for Independence** show that the variables *"Respondents´ sex"* and *"Q3.D"* (p-value=0.430) **are**

independent. On the other hand, the variables *"Age category"* and *"Q3.E"* (p-value=0.033) **are independent.**

Table 7

Mobile phone dependence – Appendix E

Question Appendix E	Scale	Gender				Total	
		Boys		Girls			
		n	%	n	%	n	%
	yes	60	55.0	49	45.0	109	100
Q1.E	only seldom	122	51.9	113	48.1	235	100
	never	70	47.3	78	52.7	148	100
	I do not mind	156	65.3	83	34.7	239	100
Q2.E	I am nervous	65	39.8	96	60.2	161	100
	I feel bad	4	25.0	12	75.0	16	100
	I solve the problem	27	35.5	49	64.5	76	100
	yes	196	51.0	188	49.0	384	100
Q3.E	no	39	56.5	30	43.5	69	100
	I do not know	17	43.6	22	56.4	39	100

Conclusion

It is very important to handle the results gained from the analysis of the impacts of mobile phone use on the pupils´ health cautiously, not to include subjective suppositions into the evaluation of the results and not to confuse effects and causes. In terms of prevention, it is important to carefully consider what is needed to be done in the future and focus on the protection of children.

510 pupils aged 10-15 years old from 8 primary schools participated in the pilot study of mobile phone use by pupils of second stage of primary schools. When evaluating the research, we divided individual questions in the questionnaire into five basic sections. After the analysis of the data gained from the general part, we found out that 18 pupils do not use mobile phones at all, and thus we continued to work with the sample of 492 respondents. Ownership of a mobile phone is for children in primary schools almost a matter of course; it is a matter of prestige.

The older a child is, the wider the range of mobile phone use is. The result of our research is that as many as 375 pupils use their mobile phones in order to communicate with their families. It further follows that the older a child is, the lower the interest in mobile communication with parents and friends is, but, on the other hand, the interest in communication on social networks and via SMS or MMS increases

From the section dealing with the frequency of mobile phone use it follows that most pupils use their phones excessively. The fact that children own a mobile

phone already at their pre-school age, 8 children even at the age of 4, is disturbing. Pupils think of a mobile phone as a device which they must necessarily have with them at all times. This is the reason why 358 pupils fall asleep next to a mobile phone which is turned on. The highest number of pupils who do so is aged between 14-15 years old.

It was interesting to find out that although 213 pupils (43.3%) agree that mobile phones can have some negative impact on human health, 295 pupils would not limit their use even if the negative effects were scientifically proved. We can only suppose that almost 60% of the pupils share this opinion because they have not realised the value of their health yet. 266 (54.1%) respondents would like to get more information about the possible health risks.

In the last section, we were interested in the pupils´ attitude towards "*Mobile phone dependence*". Despite various studies of nomophobia (dependence on something, in this case dependence on mobile phone), this phenomenon was not proved in our research. However, we cannot exclude it either. From the evaluation it further follows that inability to communicate through mobile phone is not considered to be a problem by 239 pupils (48.6%), 161 pupils (32.7%) feel nervous in this case and only 16 pupils state that they are not able to focus and feel bad. 384 pupils (78%) agreed that one can be dependent on his/her mobile phone. This thesis can be regarded as a pilot study and can serve for further analysis of some of the indicated problems. We think that public education of children and parents is inevitable. The form of passing the information about the health risks is of high importance as well. How the use of mobile phones will affect children´s lives can only be presumed for now.

Acknowledgement

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