

A SURVEY STUDY ON SOME NEUROLOGICAL SYMPTOMS AND SENSATIONS CAUSED BY DAILY USE OF MOBILE PHONES

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ABSTRACT

A survey study was conducted to investigate the possible effects of daily talking duration of mobile phone on headache, dizziness, extreme irritation, shaking in the hands, speaking falteringly, forgetfulness, neuro-psychological discomfort, increase in the carelessness, decrease of the reflex and clicking sound in the ears. There is no effect on dizziness, shaking in hands, speaking falteringly, forgetfulness, neuro-psychological discomfort and clicking sound in the ears, but some statistical evidences are found that mobile phone may cause headache, extreme irritation, increase in the carelessness and decrease of the reflex.

Keywords: *Neurological symptoms, mobile phones, daily talking duration, Biological Effects, Microwaves*

GÜNLÜK CEP TELEFONU KULLANIMININ NÖROLOJİK ETKİLERİNİN İSTATİSTİKSEL OLARAK ARAŞTIRILMASI

ÖZET

Bu yayında günlük cep telefonu kullanımının baş ağrısı, baş dönmesi, aşırı sinirlilik, ellerde titreme, kekeleme, unutkanlık, nöro-psikolojik rahatsızlık, dikkatsizlik, reflex azalması ve kulaklarda çınlama üzerine istatistiksel bir araştırma yapılmıştır. Yapılan araştırma sonucunda günlük cep telefonu kullanımının baş dönmesi, ellerde titreme, kekeleme, unutkanlık, nöro-psikolojik rahatsızlık ve kulaklarda çınlama, üzerine hiçbir etkisinin olmadığı, fakat baş ağrısına, aşırı sinirliliğe, dikkatsizliğe ve reflex azalmasına sebep olduğu ile ilgili istatistiksel bilgi bulunmuştur.

Anahtar kelimeler: *Nörolojik semptom, cep telefonu, günlük konuşma süresi, biyolojik etki, mikrodalga*

1. INTRODUCTION

The widespread use of the mobile phones has initiated many biological studies on the possible adverse effects of radio-frequency electromagnetic fields emitted by commercial mobile phones that are the most common radio-frequency source in the human exposition in everyday life (Barteri, 2005). Over the last years, an increasing number of people have been claiming that they are hypersensitive to electromagnetic fields such patients suffer generally from unspecific symptoms of ill health such as headaches, sleep disorders, skin rashes, dizziness, extreme irritation, forgetfulness, increase in the reflexes, etc. (Rööslı et al, 2004; Balıkci et al, 2004). There are many controlled experimental studies on the biological effects of use of mobile phones but many of these studies have been contradictory (Rööslı et al, 2004). In addition there is no valid ethiological studies published on the subject (Levallois, 2002). A few survey studies have been conducted recently (Rööslı et al, 2004; Thomee et al, 2005, Balık et al, 2005; Balıkci et al, 2005) to find out the influence of mobile phones on human health.

In a study, health questionnaires were distributed by the Swiss Federal Office of Public Health to people who complaint about symptoms of ill health which they ascribed to exposure to electromagnetic fields, with the aim of gaining a better knowledge of the anxieties of complaints, to obtain hints of possible problems and of actions that should be taken to solve the problem (Rööslı et al,

2004). It was found that sleep disorders, headaches, nervousness or distress, fatigue and concentration difficulties were most common complaint, respectively. Complaints related their symptoms most frequently first, exposure to mobile phone base stations and second to the use of mobile phones. It was concluded that removing or disconnecting indoor sources was judged to be the most effective action.

In another study, investigations were focused on whether high quantity of information and communication technology use is a risk factor for developing psychological symptoms among young users (Thomee et al, 2005). It was concluded that the use of information and communication technology may have an impact on psychological health. In addition, a high combined use of computers and mobile phones was associated with an increased risk of experiencing prolonged stress and symptoms of depression, at least for women.

Third survey study was conducted in 695 people to investigate possible neurological symptoms and sensations experienced by long term users of mobile phones (Balikci *et al.*, 2005). In this study no effects on dizziness, shaking in hands, speaking falteringly and neuro-psychological discomfort were found but some statistical evidence were found that mobile phones might cause headache, extreme irritation, increase in the carelessness, forgetfulness, decrease of the reflex and clicking sound in the ears.

The main purpose of this study in which a survey study, using questionnaire, was conducted in 502 randomly selected people to detect the possible neural symptoms and sensations experienced by the daily heavily talking users of mobile phones in order to light the way of further experimental studies.

2. MATERIALS AND METHODS

2.1. Questionnaire

Questionnaire used in this study was composed of two sections. In the first section, general questions were asked to individuals to learn about their general health, use of mobile phone and physical environment to prevent miss leading positives. In the second section questions were asked to directly detect the effects of call durations which have been made per day on each individual's health.

In the survey, questions were asked to investigate the following symptoms and sensations; headache, dizziness, extreme irritation, shaking in the hands,

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speaking falteringly, forgetfulness, neuro-psychological discomfort, increase in the carelessness, decrease of the reflex and clicking sound in the ears.

If an individual gave positive answer to the questions about any above symptoms and sensations, some extra questions were also asked to detect the beginning of the symptoms and sensations. Otherwise the statistical results yielded would be meaningless, unless person has not the symptoms and sensations after he has started to use mobile phone.

2.2 Study Population

The study group was consist of 502 randomly selected people from different ages, educations, earnings, locations and occupations in Elazig which is located in the east part of Turkey. For simplicity, from now the person who has got a mobile phone and the person who has not got any mobile phone will be named as “mobile phone user” and “non-mobile phone user” respectively.

502 attendants were consisting of 392 mobile phone users and 110 non-mobile phone users. These are summarised in Table 1.

Usage	Total Attendant
Mobile Phone Users	392 (78.1%)
Non-Mobile Phone Users	110 (21.9%)

Table 1: Number of people attended to the survey

As clearly seen in Table 1, although individuals were selected randomly almost 80% of people were mobile phone users. This shows that mobile phone usage is very much common in the selected region and the results yielded from the survey could be valuable.

Since the aim of this survey is to investigate the possible neurological symptoms and sensations experienced according to call durations made per day, attendants were grouped according to daily total time of talking. Daily talking durations were divided into three sub-groups. These are 1 to 10 minutes, 10 to 20 minutes, 20 to 60 minutes respectively. Table 2 shows these intervals.

Daily Talking Duration	Total Attendant
1-10 min.	306 (70.5%)
10-20 min.	97 (22.4%)
20-60 min	31 (7.1%)

Table 2: Talking durations committed in a day

Table 2 showed that more than 70% of people use their mobile phone at least 10 min. every day.

3. RESULTS AND DISCUSSION

For this survey, an analysis of variance (ANOVA) were used and differences were considered significant at $P < 0.05$.

As mentioned in Section 2.1, some extra questions were also asked to detect the starting time of the symptoms and sensations. The answers were sorted and written in Table 3.

Symptoms and Sensations	Starting Time	
	After Mobile Phone	Before Mobile Phone
Headache	220 (74.3%)	76 (25.7%)
Dizziness	13 (61.9%)	8 (38.1%)
Extreme Irritation	110 (75.3%)	36 (24.7%)
Shaking in Hands	13 (68.4%)	6 (31.6%)
Speaking Falteringly	7 (63.6%)	4 (36.4%)
Forgetfulness	45 (75.0%)	15 (25.0%)
Nero-Psychological Discomfort	31 (77.5%)	9 (22.5%)
Increase in the Carelessness	113 (86.3%)	18 (13.7%)
Decrease of the Reflex	49 (96.1%)	2 (3.9%)
Clicking Sound in the Ears	45 (77.6%)	13 (22.4%)

Table 3: Starting time of the symptoms and sensations

When we look to Table 3, apart from dizziness and speaking falteringly, vast majority of the mobile phone users reported that they had the symptoms and sensations after they had started using the cellular phone. In the dizziness

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symptom case, 61.9% of the users said that they had the symptom after the use of mobile phone whereas 38.1% of the users had had the dizziness before they had the mobile phone of which there was no possible effect. For speaking falteringly, the percentages were 63.6% and 36.4% respectively. With Table 3, statistical results found in this contribution should be taken into account.

Since analysis of variance (ANOVA) was used to analyse data, *P*-values of each symptom and sensation were given in Table 4. The first column of the table shows the considered symptoms and sensations. In the second column, *P*-values were calculated and written for mobile phone users and non-mobile phone users. For this column *P*-values of 4 out of 10 found to be meaningful. In the last column of Table 4, daily talking duration that individuals committed by the mobile phone were taken into account. Again 4 out of 10 values of symptoms and sensations which are identical to second columns were found to be meaningful.

Symptoms and Sensations	Mobile Phone user & non-user	How they use the phone
Headache	0,000*	0,000*
Dizziness	0,968	0,184
Extreme Irritation	0,000*	0,002*
Shaking in Hands	0,337	0,278
Speaking Falteringly	0,651	0,076
Forgetfulness	0,245	0,525
Neuro-Psychological Discomfort	0,222	0,559
Increase in the Carelessness	0,012*	0,016*
Decrease of the Reflex	0,002*	0,008*
Clicking Sound in the Ears	0,428	0,722

Table 4: *P*-values (* : $p < 0.05$) for ANOVA

If both second and last column are considered, *P*-values of 4 out of 10 symptoms and sensations were found to be less than 0.05. These are headache, extreme irritation, increase in the carelessness and decrease of the reflex.

The main goal of this survey is to investigate the neurological effects of mobile phone for total daily duration. As seen in Table 4, there are 10 neurological

symptoms and sensations were investigated. Results were summarised including number of people attended to each case in Table 5 and their percentages were given in Table 6. The statistical results found here as follows;

Headache : According to the results given in Table 5 and 6, the use of mobile phone may cause headache, because the percentages of having headache were increased from 56.4% to %75.5. Moreover there was statistical evidence that the percentages were increased for long daily talking durations. The percentages of 1-10 min/day, of 10-20 min/day and of 20-60 min/day were 72.2%, 85.5% and 90.3%, respectively. This results supports (Balikci *et al.*, 2005, Rösli *et al.*, 2005; Santini *et al.*, 2003 (a)).

Dizziness: As a result of Tables 3, 5 and 6, the use of mobile phone did not cause dizziness. This results supports (Balikci *et al.*, 2005, Hietanen *et al.*, 2002; Koivisto *et al.*, 2001, but contradicts to (Rösli *et al.*, 2005).

Shaking in Hands: As a result of Tables 3, 5 and 6, daily use of mobile phone had no visible effects on shaking in hands, as in long term use of them (Balikci *et al.*, 2005).

Speaking Falteringly: As a result of Tables 3, 5 and 6, daily use of mobile phone had no visible effects on speaking falteringly. This symptom was not detected in long term use of mobile phones too (Balikci *et al.*, 2005).

Forgetfulness: As a result of Tables 3, 5 and 6, daily use of mobile phone had no visible effect on this symptom. But forgetfulness was decreased by the long term use of mobile phones (Balikci *et al.*, 2005).

Neuro-Psychological Discomfort: As a result of Tables 3, 5 and 6, daily use of mobile phone had no visible effect this symptom. This result supports (Balikci *et al.*, 2005, Hietanen *et al.*, 2002; Cook *et al.*, 2002).

Clicking Sound in the Ears: As a result of Tables 3, 5 and 6, daily use of mobile phone had no visible effect on this sensations. But clicking sound in the ears was decreased by the long term use of mobile phones (Balikci *et al.*, 2005).

Extreme Irritation : Our data showed an indication of causing extreme irritation, this is why the percentages of having extreme irritation were increased from 19.1% to 37.2% Moreover talking mobile phone for a long period in a day may increase the possibility of having extreme irritation too (Balikci *et al.*, 2005). This was because the percentages increased from 35.6% to 45.5% when the survey attendants talk 10 min more in a day.

Increase in the Carelessness : As a result of Table 5 and 6, the use of mobile phone may cause increase in the carelessness. This is why the percentages of possibility of having increase carelessness were increased from 20.9% to %33.4. In addition the percentages were increased gradually from 31.0 to 40.0 and then to 45.2 when a person talk more in a day (Balikci *et al.*, 2005). So it could be suggested that the more you talk the more you become careless.

Decrease of the Reflex : According to data, the use of mobile phone may cause decrease of the reflex because the percentages were dramatically increased from 2.7% to %13.0 and daily talking duration may trigger having decrease of the reflex as a result of more exposure. The increasing percentages were 11.8%, 16.4% and 19.4 % for 1-10 min., 10-20 min. and 20-60 min. respectively (Balikci *et al.*, 2005).

4- CONCLUSION

Some neurological symptoms and sensations caused by the daily use of mobile phones were investigated in this study. It was found that daily use of mobile phone may cause headache, extreme irritation and increase in the carelessness and decrease of the reflex. These symptoms and sensations were also detected in the long term use of mobile phones. In addition, forgetfulness and clicking sound in the ears were not caused by the daily use but caused by the long term use of mobile phones (Balikci *et al.*, 2005). Dizziness, shaking in hands, speaking falteringly and neuro-psychological discomfort were not reported by the daily use of mobile phones in this study.

Symptoms and Sensations	Non-Mobile Phone Users		Mobile Phone Users							
	Total		Durations						Total	
			1-10 min.		10-20 min.		20-60 min.			
YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	
Headache	62	48	221	85	47	8	28	3	296	96
Dizziness	6	104	16	290	1	54	4	27	21	371
Extreme Irritations	21	89	109	197	25	30	12	19	146	246
Shaking in Hands	3	107	15	291	1	54	3	28	19	373
Speaking Falteringly	4	106	5	301	4	51	2	29	11	381
Forgetfulness	12	98	48	258	9	46	3	28	60	332
Nero-Psychological Discomfort,	7	103	32	274	6	49	2	29	40	352
Increase in the Careles sness	23	87	95	211	22	33	14	17	131	261
Decrease of the Reflex	3	107	36	270	9	46	6	25	51	341
Clicking Sound in the Ears	13	97	43	263	10	45	5	26	58	334

Table 5: Distribution of people attended to the survey for symptoms and sensations

Symptoms and Sensations	Non-Mobile Phone Users		Mobile Phone Users							
	Total		Durations						Total	
			1-10 min.		10-20 min.		20-60 min.			
	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Headache	56,4	43,6	72,2	27,8	85,5	14,5	90,3	9,7	75,5	24,5
Dizziness	5,5	94,5	5,2	94,8	1,8	98,2	12,9	87,1	5,4	94,6
Extreme Irritations	19,1	80,9	35,6	64,4	45,5	54,5	38,7	61,3	37,2	62,8
Shaking in Hands	2,7	97,3	4,9	95,1	1,8	98,2	9,7	90,3	4,8	95,2
Speaking Falteringly	3,6	96,4	1,6	98,4	7,3	92,7	6,5	93,5	2,8	97,2
Forgetfulness	10,9	89,1	15,7	84,3	16,4	83,6	9,7	90,3	15,3	84,7
Nero-Psychological Discomfort,	6,4	93,6	10,5	89,5	10,9	89,1	6,5	93,5	10,2	89,8
Increase in the Carelessness	20,9	79,1	31,0	69,0	40,0	60,0	45,2	54,8	33,4	66,6
Decrease of the Reflex	2,7	97,3	11,8	88,2	16,4	83,6	19,4	80,6	13,0	87,0
Clicking Sound in the Ears	11,8	88,2	14,1	85,9	18,2	81,8	16,1	83,9	14,8	85,2

Table 6: Distribution of people attended to the survey for symptoms and sensations in percentage

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