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Ownership And Use Of Mobile Phone- A Population Based Study Physical Education And Sport College Students In Turkey

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Abstract

Purpose: Recent years have seen a rapid increase in the use of mobile phones, raising concers about possible adverse health effecets**.** The present study aims to find out the prevalence of mobile phone usage of the students educated in sports training in the university. **Material and Methods:** This cross-sectional study was carried out 01 October and 31 May in 2010. 1325 students (94.5%) out of total 1402 studying in the Department of Physical Education and Sports Schools of five different universities located on the Black Sea accepted to participate in the study. A questionnaire form was applied to the participants under the observation of the researchers. **Results:** In the study, although 1036 (78.2%) of the students said that mobile phones had adverse health effects, it was found that 1305 (98.5%) students used mobile phones, 251 (18.9%) had more than one mobile phone and each talk took the least median 3 (1-14) minutes and the most median 10 (1-14) minutes. 506 (38.8 %) of the mobile phone users said that they talked on the mobile phone while driving. **Conclusion:** As a result, it was found that the use of mobile phones among the students was common and they usually carried their mobile phones on them during their classes. Even though mobile phones are important for those students studying away from their homes to keep in touch with their families, it is suggested that they should pay attention to some practices while using their mobile phones.

Keywords**:** Mobile phone, Physical education and sport college, student, Turkey

1. Introduction

As a result of fast technological developments occured in the last decade, many devices transmitting electromagnetic waves such as most importantly mobile phones, base stations, microwave ovens have become an integral part of our daily life [1,2]. Availability of video phones and different options in different operators have facilitated the mobile phone use and provoked the individulas to have more than one line and mobile phone.

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According to the report of International Telecommunications Society published in 2011, it was declared that the number of mobile phone subscriptions reached about 5 billion globally [3]. Many European countries now have a mobile phone penetration rate of more than 100%, which is to say there are more subscribers than inhabitants [4]. In Turkey, as of March 2011, there are a total of 61.7 million mobile subcribers which corresponds to about % 84 penetration rate [5,6].

As a result of all these developments, at present, individuals expose to more electromagnetic fields (EMFs). Scientific knowledge about the health effects of EMFs is substantial and is based on a large number of epidemiological, animal and invitro studies. Epidemiological studies focused on headaches and heat sensation symptoms and on risk of brain tumours, cancer, breast cancers, or leukaemia [2,7-9]. Experimental studies have also assessed the effects of EMFs in human on EEG, cognitive functions, sleep phases and reaction times and heart rate variability. Animal experiments, which allow more detailed or invasive investigations, are complementary to these human studies, have been performed in rodents exposed to EMFs to study alteration of neurotransmitters release, blood-brain barrier permeability, or vascular permeability [1,8-11]. The WHO/International Agency for Research on Cancer (IARC) has classified radiofrequency EMFs as possibly carcinogenic to humans (Group 2B), based on an increased risk for glioma, a malignant type of brain cancer, associated with wireless phone use [12].

The effect of electromagnetic field transmitted by mobile phones on biological tissue is expressed by SAR value in W/kg unit. Kuster measued 16 digital phones and reported that digital phones had a SAR value between 0.28 and 1.33 W/kg [13] and some researchers have been carrying out various epidemiologic studies in humans by taking into consideration the importance of SAR value [13-17]. Some studies report that since the dielectric properties are different in children, young adolescents and adults, the degree of exposure is also different [1,4,8,9,18]. ICNIRP-2009 and other reports indicate that there are very few reports about the susceptibility of children and adolescents to EMFs and also there are limited number of biological studies [8,9,18,19]. Because nervous systems of children and adolescents are still developing and as they drink more water, their brain tissues have greater conductivity and exposure to longer life expectancy, ICNIRP, Swedish Radiation Safety Authority (SSM) reports and WHO suggest that experimental and epidemiological studies are required concerning childhood and adolescence period [8,18,19].

The present study aims to find out the prevalence of mobile phone usage of the adolescence period students educated in sports training in the university and to examine the symptoms depending on SAR value.

1. Materıals and methods

Working methods were arranged according to the instruction of Helsinki Declaration [20]. Samples obtained from 17–22 year-old students studying in the Departments of Physical Education and Sports of five universites (Ondokuz Mayıs University, Amasya University, Gaziosmanpaşa University, Karadeniz Technical University and Kastamonu university) in the Black Sea Region, which makes up one fifth of Turkish population, were included in the study. This cross-sectional study was carried out between the first of October and the 31st of May in 2010. 1325 students (94.5%) out of total 1402 studying in the study.

The lecturers working at the universities involved in the study were informed about the subject and accepted to apply the survey to the students under observation. The survey consisting of 38 questions and answers included both appropriate alternative marking and writing some numbers and if needed, included their interpretation. The first 18 questions included the questions about date of birth, sex, marital status, informatin about the university and the student and the family (such as number of siblings, structure of the family, parents' level of education, employment status of parents, monthly family income) and about the usage and frequency of the devices transmitting non-ionizing radiation at lower and higher frequencies.The other 20 questions of questionnaire form were concerning the mobile telephone using-non using, the duration of mobile phone use, features of the mobile

phone on purchase, knowing the SAR value of their phones, the place where phone is carried (trouser pocket, shirt pocket, bag etc.,), having unlimited tariff to all directions, monthly duration of mobile phone use, the aim of mobile phone use, leaving the mobile phone on at night, if so its place, talking on mobile phone while driving. Daily talking duration of mobile phone was grouped in three categories as less than 2 minutes, 2-5 minutes and more than 6 minutes [21]. Regular mobile phone usage was defined as talking for ≥ 2 min per day [4].

The amount of the non-ionizing radiation energy absorbed by the user is defined with Spesific Rate-SAR. It is noted in ICNIRP 2009 report that different SAS values affect different tissues. In this study, SAR value is categorized as <0.0 and ≥0.5 by considering SAR values effective in the head [8,17,22-24].

Data Analysis

Statistical analysis was carried out using SPSS. First frequency tables were produced for background variables as well as those showing use of mobile phone access and regular mobile phone use. Some specific questions relating to the aim of the study were then chosen for further analysis to determine any differences between, for instance, gender in respect to mobile phone use. Questions concerning differences between groups in use of mobile phone were examined by $\chi 2$ and Fisher exact test. Data are given as mean ± standart deviation, median (minimum and maximum) and numbers (percentage). A result was considered to be statistically significant when the significance probability was 5% or less.

2. Results

It was found that the mean age of the participents was 21.5 ±2.6 years, 536 (40.5%) of them were girls and 789 (59.5%) were boys, 1301 (98.2%) were single and 1047 (79.0%) were away from their families. Monthly incomes of the families of 301 (22.7%) students were lower than minimum wage. While 1305 (98.5%) participents said that they used mobile phones and 252 (18.9%) said they had more than one mobile phone, it was found that median number of mobile phones was 1 (1-3). The median SAR value of these mobile phones in use was 0.7 (0.1 – 1.5). The students using mobile phones said that they were mobile phone users for median 6 (1-10) years. Among all respondents, while 1305 (98.5%) participants had mobile phones, 1254 (94.6%) were regular users. Across all age group, 5.4% (n=71) reported talking by mobile phone <2 min per day, 12.8% (n=169) 2-5 min per day and 81.9% (n=1085) ≥ 6 min per day.

Of the girls, 2.1% (n = 11) reported talking for < 2 min per day compared with 7.6% (n = 60) of the boys; 9.9% (n = 53) compared with 14.7% (n = 116) talked for 2–5 min per day, 88.1% (n = 472) compared with 77.7% (n= 613) for ≥6 min per day(Figure 1). Mobile phone access was reported by 98.9% of the girls compared with 98.2% of the boys (p = 0.337) and regular use by 97.9% of the girls compared with 92.4% of the boys (p<0.001, x^2=19.402). Some features related to the use of mobile phones are presented in Table-1.

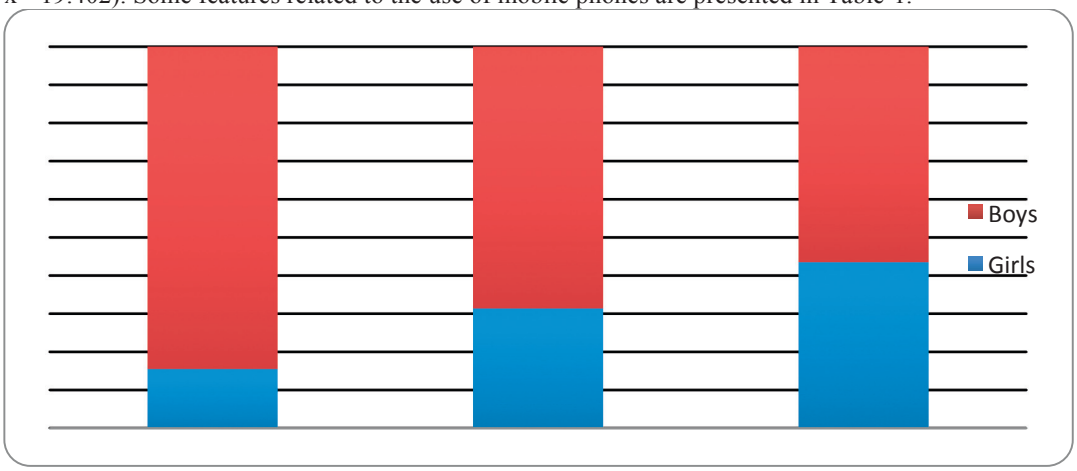

Figure 1: Percent Distribution of Average Use in Minutes Per Day of Own Mobile Phone in The Sex Groups

Table – 1: Reported Mobile Phone Access and Regular Mobile Phone Use

	Students who reported mobile phone Access	**Students who reported regular use**
	Access/no Access	**Regular use/no regular use**
Sex		
Female	530/6	525/5
Male	775/14	729/46
p, x^2	0.337	**0.000, 20.89**
Siblings		
Yes	1291/19	1241/51
No	14/1	13/0
p, x^2	0.099	0.0594*
Household income		
Lower than minimum wage	296/5	280/20
High than minimum wage	1009/15	970/35
p, x^2	0.489*	**0.016, 5.80**
The place where the mobile phone is carried during the lesson		
Trouser or tracksuit pocket	771/3	723/46
Bag	540/2	531/5
p, x^2	0.668*	**0.000, 21.44**
The aim of mobile phone use		
Talk	818/0	711/31
Short message	562/0	560/24
Internet	11/0	10/2
Game	9/0	13/1
p, x^2	**	0.185
Those who leave their mobile phones on at night	1185/0	1148/37
The place where mobile phone is kept at night		
Bedside	461/0	466/14
Under the pillow	374/0	340/7
Somewhere away from bedside	350/0	342/16
p, x^2	**	0.306
Those using mobile phone while driving	818/0	795/24
p, x^2		
Those knowing the SAR value of their phones	246/0	256/10
p, x^2		
Those having unlimitted lines	109/0	99/30
p, x^2		

* Fisher exact test
** Not evaluated

1036 (78.2%) of the students said that mobile phones have adverse health effects. 569 (54.9%) of these students said mobile phones transmit radiation, 175 (16.9%) of the students said they cause dizziness, 158 (15.3%) of them said they cause headache, 54 (5.2%) of them said they cause arrhythmia, 50 (4.8%) of them said they cause parapraxia and 29 (2.8%) of them said they cause sleep disorder.

590 (45.2%) of the students said that they pay atenttion to the price of it, 266 (20.4%) of them to the SAR value, 183 (14.0%) of them to technical characteristics, 162 (12.4%) of them to the model and 64 (4.9%) of them to the clour of it while choosing the mobile phone.

In the study, when SAR values of the mobile phones of 1305 students who were mobile phone users were examined, it was found that 1194 (91.5%) of them used the mobile phones having ≥ 0.5 SAR value. The effect of

daily talking duration and SAR value on the symptoms is shown in Table- 2 and Table-3 by taking into consideration male and female candidates.

Table-2: The Percentage of The Prevalence of Symptoms Experinced Weekly For The Students

	Daily Talking Duration			
	< 2 minutes (n=50)	2-5 minutes	≥ 6 minutes	
Symptoms		(n=139)	(n=905)	p, x^2
Headaches	13	34	253	0.673
Warmth on ear	5	42	300	**0.003;11.89**
Tinnitus	6	32	254	**0.025; 7.35**
Concentration	5	10	120	0.113
Giddines	4	9	108	0.126
Dizziness	5	10	94	0.504
Fatigue	1	7	65	0.256
Discomfort	3	7	51	0.951

Tablo-3: Distribution of the symptoms of male and female mobile phone users

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	Female (n=530)		Male (n=775)		p, x^2
Symptoms	n	%	n	%	
Headaches	193	36.4	170	21.9	**0.000, 32.87**
Warmth on ear	187	35.3	219	28.3	**0.007, 7.25**
Tinnitus	162	30.6	172	22.2	**0.001, 11.59**
Concentration	75	14.2	84	10.8	0.072
Giddiness	64	12.3	75	9.7	0.168
Dizziness	56	10.6	74	9.5	0.547
Fatigue	41	7.7	43	5.5	0.114
Discomfort	25	4.7	45	5.8	0.391

3. Discussion

International Telecommunications Society has announced that the number of people using cellular phones is roughly equivalent to one-sixth of the entire world population [1,3,4]. It has been observed that the use of mobile phones is common among young people in globally [11]. Although three - fourths of the participents noted that mobile phones have adverse health effects in present study, it is noteworthy that almost all of them use mobile phones. In spite of the fact that EMFs transmitting devices, especially phones have adverse effects, they have become an integral part of our daily life [1,2].

This condition might be due to the fact that details on the harmful effects of cellular phones are not well recognized or although people are aware of these harmful effects they perceive it as a lifesaver in some occasions.

It is surprising that 18.9% of the students have more than one mobile phone. Using more than one mobile phone so as to be able to benefit from various campaigns of different operators and to talk cheaper increases EMFs exposure risk.

The students in the Department of Physical Education and Sports School chosen as research group in this study consist of a group doing sports actively during their education. More oxygen is needed to meet increased ATP needs of the body while doing sports, on the other hand, body temperature rises with the increased workload. Therefore, the mechanisms of the adaptation of the cardiovascular system steps in corresponding to the increased workload. Heart rate and stroke volume increase with the rise in cardiac output [25]. A review, reported by WHO, concluded that cardiovascular system responses to EMFs exposure, such as changes in heart rate and arterial blood

pressure, are consistent with those associated with thermoregulatory responses to conventional heating. In general, an increase in body temperature elicits several cardiovascular changes, including increased blood flow to the skin, increasing skin thermal conductance, and increased cardiac output, primarily due to an increase in heart rate, in order to maintain arterial pressure within the normal range. On the other hand, the most sensitive systems to EMFs are whole nervous system including cardiovasculer system and especially autunomic nervous system. As a result of this, neurovegetative adaptation and cardiovasculer functions are affected [18]. Eigthty one point five percent of the students participated in this study carry their mobile phones in either their trouser pockets or tracksuit pockets, which causes more increase in the cardiovasculer system load of the students.

Almost all of the participants said that they use mobile phone to communicate and text. Taking into consideration that these are university students and three-fourths of them do not live with thier families, mobile phone is of great importance to communicate with their families. On the other hand, despite the fact that one-fourth of the families of the participants had an income lower than minimum wage, it was noteworthy that almost all of the students had mobile phones.

It was found that students who used mobile phones started to use them during the period of secondary education. It brings out the truth that despite the advice of WHO, children under 16 years of age use mobile phone increasingly and they expose to more RF radiation than adults throughout their lives [26]. There is now sufficient experimental evidence that mobile phone exposure does alter brain activity in young adults, particularly alpha (the 8–13 Hz) electroencephalographic index of neural activity. Such biological effects may be more significant for children, because it has been argued that different head shapes and thinner skulls may make them more susceptible to RF energy [27,28]. RF exposure from a mobile phone handset has been associated with slightly shorter reaction times in children [29]. However, other short-term experimental exposures have not found any consistent effects on cognitive function in children [30]. Recently, a follow-up of a national birth cohort has suggested that behavioural difficulties around the age of school entry were more likely among children who had been exposed to mobile phones in utero or postnatally [31].

They said that each talk lasted the least median 3 (1-14) minutes and the most median 10 (1-14) minutes, moreover, 89.4% of them said that they left mobile phones on at nights and 38.9% of these said they kept thier mobile phones on bedside. As the talk takes longer, the exposure becomes greater. Exposure comes out in two ways, one is thermal exposure and the other one is non-thermal. Thermal exposures cause alteration in body temperature and cell death in the exposed site due to increased temperature. Although the mechanism of non-thermal exposue has not been yet well-understood, it has been proven through studies that it is radical and causes alterations in organism such as DNA structure [8].

Thirty eight percent of them said that they used a mobile phone while driving. Surveys indicate that drivers often talk on mobile phones. A 2004 observational survey of drivers of passenger vehicles in the United States indicated that at any given time of day 5% were talking on hand held phones [32,33]. Most research on the safety implications of drivers' use of mobile phones has been experimental in design, involving small samples of volunteers. These studies have found that phone use impairs performance on simulated or instrumented driving tasks, using such measures as reaction time, variability of lane position and speed,10 following distance, and situational awareness [34,35]. A person using a mobile phone when driving is four times more likely to have a crash that will result in hospital attendance. Sex, age group, or availability of a hands-free device do not influence the increased likelihood of a crash [35].

While 1.0% of the students know the SAR value of their phones, 16% of them know the meaning of specific absorption rate (SAR) and 20.4% of them care for the SAR value while buying a phone. SAR is a highly important concept. The amount of microwave energy absorbed by the user is described by the SAR. In the measurements conducted by Kuster in 16 differnet digital phones, SAR values were found to have changed between 0.3–1.3, but Sandström et al suggested that in fact there should have been higher SAR values [21]. In our study, the phones which the candidates had consisted of 16 different phone brands and 93 different models of these brands. The SAR values of the mobile phones were between 0.2 and 1.5. In the study carried out by Smyt and Coastal on 33 males and 29 females, they noted that in the exposure of mobile phone having 0.79 SAR value, there was a difference in the influence in the cognitive performance between males and females in the usage of mobile phones [14]. Regel et al., reported that there was significant influence in the exposure to electromagnetic frequency of 900MHz and 1 W/kg SAR value in the studies in human subjects about cognitive performance and the walking

electroencephalogram (EEG). Regel et al., found out that there was an alteration in the non -REM sleep and cognitive performance between 0.2 and 5 W/kg in the other study they carried out and they showed the physiological effect of the elctromagnetic field on the brain depending on the SAR value for the first time [15,16]. Sun et al., searched the effect of 1.8 GHz RF exposure of different intensity in the clusting and phosphorylation of the epidermal growing factor (EGF) receptors in human amniotic (FL) cells in their in vitro studies. In their study, they reported that there were influences of 0.5, 1.0, 2.0 and 4.0 SAR valus on the cells and there was not such an effect of 0.1 SAR value [17]. ICNIRP has accepted 0.08W/kg as a borderline for public health. In this study, the most preferred cellular phone mark (25%) has a 0.69 W/kg SAR value. There are also some marks, which have SAR values over 2.0 W/kg that is above the recommended threshold [8,13].

Conclusıon and recommendatıon

As a result, it was found that the use of mobile phones among the students was common and they often carried their mobile phones with them during their lessons. Although mobile phone is important for these students studying away from their families for communication with thier families, it is suggested that they should pay attention to some practises while using; at least they sould not carry them in their pockets during lessons, be careful about the duration of talk by considering the SAR values, keep them out of the room they sleep in and should not use mobile phone while driving.

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