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Data Analytics and Predictions in Cell Phone usage

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1. Introduction

Mobile phone usage has become an order of the day. The whole human race is addicted to the usage of cell phones in one way or other. The mobile phone system is known as "cellular telephone system" because of the divisions in the coverage area as "cells "each of which has a base station antenna. Mobile phones use electromagnetic radiations in the Microwave range around 2.5 GHz. When the user talks on mobile phone, the transmitter takes the sound and encodes on to a continuous "sine wave" and it directs the signal to the antenna which then sends the signal out. The encoded signals contain electromagnetic radiations. These waves are picked up by the receiver in the base station tower. Mobile phones use electromagnetic radiation in the microwave range [1]. The radio waves emitted by the mobile phone handset will be absorbed by the head by frequent usage and most of the heating effect occurs in the head region. Temperature in the internal ear, brain increases by 1 degree or more. This greatly affects the functioning of these organs since these have fluid filled cavities. Brain waves such as alpha beta, delta waves will be affected when exposed to pulsed radiations. In addition Alzheimer's/ Parkinson's disease, Hearing impairments, Infertility, Genotoxic effects, Eye problems in retina, iris and corneal endothelium, Headaches, sleep disorders, Depression & tiredness and Fatigue **[2]** are frequently observed among all cell phone users particularly in the student population. In the present day world young students both male and female are addicted to the excessive usage of cell phones inviting health problems in spite of many advantages in the usage of cell phone based communications **[3].** .software implementations of the data analytics can be created in future to extend the predictions for more diseases and disorders among larger population. This paper deals with the data analytics of this problem creating awareness about few of the cell phone related health problems among young students.

2. Materials and Methods

In a study of teenagers by Pew Internet and American Life project. Gaming and Civic Engagement Survey of Teens / Parents Nov2007-February-2008,many of them are involved in the usage of cell phone based application or computer usage in e- mailing etc on a regular basis at a very young age where the muscles ,tissues of the body, bones and vital organs are at the growing stage. The study reveals that 38 % of the teenagers are busy sending text messages through cell phones , 36 % are busy in making calls , 32% are busy communicating via landlines,29 % spending time with their friends,26% busy with their social network friends, IM by 22% and e-mailing daily by 16 % of the Teen population. The entire sample profile indicates that youngsters are addicted to the usage of mobile phones which is a great electronic gadget electronic gadget for amusement purposes.

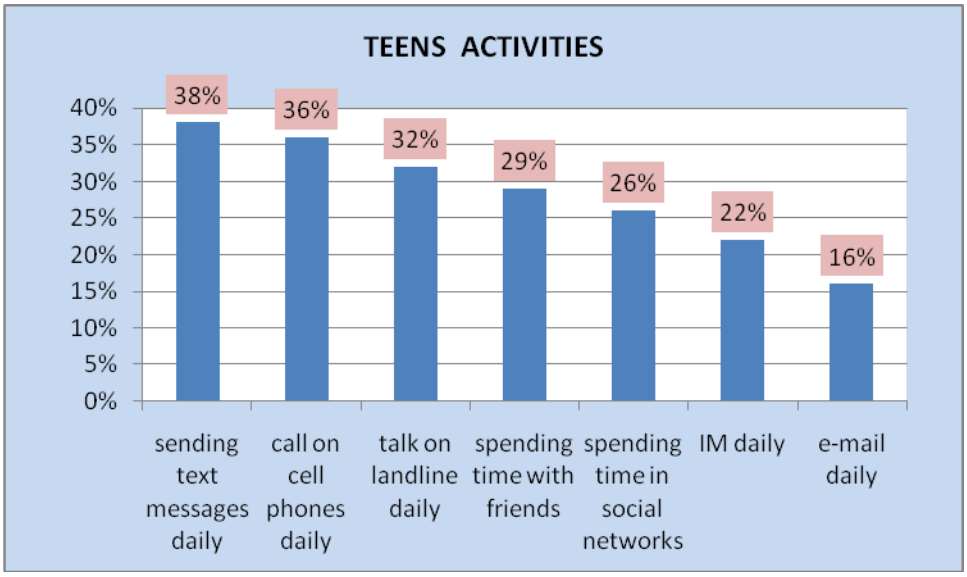

Figure 1. The percentage of frequent activities by the teens taken from Source: Pew Internet and American Life Project. Gaming and Civic Engagement Survey of Teens / Parents Nov2007-February-2008.

3. Statistical analysis

Data samples are collected from the sample student population of 350 in and around Tiruchirapalli area in Tamilnadu by circulating a questionnaire about their cell phone usage. Frequency tables are used to present the distribution of nominal values. Results are expressed in numbers as percentages of respondents to each of the question and presented in the table. Non parametric Chi-Square test **[5]** was used. A p value less than 0.05 is considered to be statistically significant. In the data sample collected various health problems are observed among the student population .From the observations of the sample population data was collected by group discussions and questionnaires. The various health hazards could inhibit their academic progress and symptoms of long term health related problems were carefully noted. Many youngsters are fancied by the usage of new features for amusement and slowly it becomes an addiction for the population who often complain about hearing impairments, eye related problems, sleep disorders, depression and fatigue **[4]** disturbing their studies**.**

4. Data analytics and predictions

Initially let our model form a null hypothesis**[6]** H_0 as the three categories who have habit of using cell phones are independent of the various health hazards tabulated as the number of affected the student population in each level. The lesser time cell phone users form the first category as A_1 and the moderate users form the second category A_2 and the excessive cell phone users form the third category as A_3. The major health hazards observed in the sample population is tabulated as hearing impairments as B_1, headache and eye problems as B_2 and sleep disorders as B_3.These are shown in Table 1. The observed and expected cell frequencies are tabulated in Table 2.With this mathematical model we formulate the test of significance.

Table 1.Cell phone usage and health hazards in sample population

Cell phone usage	**Health hazards observed in the sample population**			
	Hearing Impairment **(B_1)**	Headache and eye problems **(B_2)**	Sleep disorders **(B_3)**	**Total**
(A_1) :Less cell phone users	10	25	65	**100**
(A_2) :Moderate Cell phone users	15	30	65	**110**
(A_3) Excessive cell phone users	50	60	30	**140**
Total	**75**	**115**	**160**	**350**

Table 2. Cell phone usage and health hazards in sample population-O_i, E_i values.

Cell phone usage	**Health hazards observed in the sample population**			
	(B_1)	**(B_2)**	**(B_3)**	**Total**
A_1	10 (21.4)	25 (32.9)	65 (45.7)	**100**
A_2	15 (23.6)	30 (36.1)	65 (50.3)	**110**
A_3	50 (30)	60 (46)	30 (64)	**140**
Total	**75**	**115**	**160**	**350**

5. Results and Conclusions

The Null hypothesis H_0 assumes that the normal, moderate and excessive cell phone users among the sample student population are independent of the health hazards. Let $\mathbf{A_1}$ represent the lesser cell phone users and $\mathbf{A_2}$ the normal cell phone users and $\mathbf{A_3}$ the excessive cell phone user .The null hypothesis states that all these categories of cell phone users are independent of the health hazards. Under this assumption the expected cell frequencies are calculated. $E(A_I, B_i) = ((\mathbf{A_1}) (B_1)/N)$ where N=1,2,3.The observed and expected frequencies are tabulated in table 2**.** Since $\chi 2 = \sum (O_i - E_i)^2 / E_i = 60.23$. The d.f = (3-1) X (3-1) =4.*The table value for* $\chi 2$ at 4 d.f at 5% level of significance=9.488.The calculated value of $\chi 2$ is 60.23>9.488 at 5 % level of significance and 4 degrees of freedom. Therefore it is highly significant and the hypothesis is rejected at 5% level of significance and we can conclude that the usage of cell phones is dependent on the various health hazards like hearing impairments, eye related problems, sleep disorders, depression and fatigue etc. Thus we can conclude by creating an awakening to the young student population about the health hazards connected with the cell phone usage so that they can take preventive measures.

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