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## The Effect of Duration of Smartphone Usage on Neck Pain

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### **Abstract**

Smartphone is one of developing information and communication technology capable of providing information services quickly and accurately so make Smartphone as the needs for almost people today. Smartphone connected to the internet will help students to find information that can sustain their knowledge in school. Improper using Smartphone such as excessive duration using, wrong position, less lighting room will affect the health, especially muscles and nerves. The purpose of this study was to analyze the effect of duration of Smartphone using to neck pain. This study used a quantitative approach with the type of analytic research and included cross sectional research. The research population are all students SMAN 01 Kraksaan Probolinggo which have a Smartphone for about 979 students. In this study, 91 respondents are obtained by simple random sampling and carried out in August 2017. To find the effect of the duration of Smartphone using to neck pain is used Chi-Square Test. The results of this study as many as 37 respondents (40.7%) are using a Smartphone with a high duration, 53 respondents (58.2%) experienced neck pain in using Smartphone. Chi-Square test results obtained P value 0,000 data with significant 0.05 level so it can be concluded H1 accepted if the price of P value <0.05 which means there is influenced duration of Smartphone using to neck pain in SMAN 01 Kraksaan – Probolinggo. Technology is created because it has benefits that can help or facilitate human in life. In addition to a positive impact, using Smartphone can also cause negative impacts in terms of health if the use is not appropriate, among others, can cause dizziness, tired / hot eyes.

**Keywords:** Duration, Smartphone, Neck pain

### **I. INTRODUCTION**

The role of information and communication technology is very important because the flow of globalization requires a person to be able to get fast and accurate information. Smartphone is one the developing information and communication technology capable of providing information services quickly and accurately so as to make the Smartphone as a necessity for almost people today. Increasing amount of Smartphone usage as well as the way communicating is changing, bringing a joy in the use of technological tools to help and simplify human life activities (Doni H *et al.*, 2015).

Smartphone is an electronic device in which there is a mobile phone function as a communication tool and Personal Digital Assistant (PDA) which has a variety of application features that can be installed by all users (Yang *et al.*, 2007). Indonesia is one of the countries that have the largest Smartphone user growth after China, India and America. Indonesia estimated by 2018 to surpass 100 million active Smartphone users and make it the fourth most populous country in the world after China, India and the United States, it is stated by Research Institute of Digital Marketing Emarketer (Kominfo, 2015).

Smartphone is one tool or media that many owned by the students or learners and adolescents at the present moment. Smartphone can be useful for students or students if used for learning purposes. Smartphone connected with internet services will help students find information that can sustain their knowledge in school (Beauty M *et al.*, 2015).

News Wire (2015) In Radian states that Smartphone users in Indonesia spend an average of 2.4 hours each day and put Indonesia in 7th out of 12 countries as the country with the longest Smartphone usage duration. Children and adolescents aged 8 - 18 years spend an average of seven and a half hours (7,5 hours) to use their Smartphone, according to the Kaiser Family Foundation. Excessive use of Smartphone will adversely affect the health condition of its users (Radian NS, 2014). Using a Smartphone with a long duration, with an incorrect body position can cause various physical problems, including pain in the neck and shoulders and if it shows high levels of muscle fatigue it can cause pain (Sangyong L *et al.*, 2015).

Research conducted in Korea involving 34 respondents of adult age with front posture is divided into 3 groups with the duration of Smartphone usage : 11 people for 10 minutes (group 1) 12 people for 20 minutes (group2), 11 people for 30 minutes (group 3). Neck muscle fatigue was measured by electromyography and pain before and after the experiment was evaluated using a Visual Analog Scale (VAS) score. The result was a significant difference between groups 1 and 3 in fatigue levels in trapezium muscle (neck muscles). The conclusion of the study suggests that neck pain increases with the duration of Smartphone using (Seong Y *et al.*,2016).



Improper use of Smartphone such as frequency and duration of excessive use, incorrect positioning will affect our health, especially muscles and nerves (Fishman, 2009 In Radian NS, 2014). The condition is exacerbated by the use of Smartphone in the room that is not enough lighting then it can cause the eye to work extra (power accommodation) which if done with a long time period will cause the eyes easily tired, the eyes feel hot which in the end can cause pain in the neck or head (Ika Nurwulandari, 2014).

The use of Smartphone has a positive and negative impact, it depends on how a person, especially students or learners interpret the use of the Smartphone. Some of the positive impacts of Smartphone used for students or learners include: accelerate access to information widely and quickly so as to increase knowledge insight, facilitate in communicating, especially if used to create discussion forum. The negative impact of Smartphone uses for students include: 1). make lazy and make the brain become weak because of easy in finding information so that students are lazy to think. 2) the use of Smartphone that cannot be separated from the internet causes using excessive pulse so that spending becomes more. 3) the chance of the learner to access things that should not be accessed, such as pornographic videos (Hafizd, 2014).

In addition to these negative impacts, excessive use of Smartphone can lead to disruption of health functions in our body, among others, cause pain in the neck and head, anxiety, insomnia (difficulty sleeping), can also cause negative effects on the psychological status of a person, such as depression (Park *et al.*, 2015). In addition, the reproductive system in men can be disrupted by exposure to electromagnetic waves on the Smartphone; this can happen if often keep the Smartphone in a trouser pocket (Roseana, 2015).

The role of parents at home is desirable to help teenagers in this case students or students to be able to limit themselves in the use of Smartphone, the same can also be done at educational institutions. Parents and teachers work together to monitor them in using Smartphone. One of the things that can be done by parents and teachers, among others, provide information about the negative impact on health in the excessive using Smartphone that ultimately can interfere or even hinder the process of learning.

## II. METHODS

The purpose of this study was to analyze the effect of duration factor of Smartphone usage on neck pain. This research uses a quantitative approach with the type of analytic research. Analytic research is a study aimed at testing hypotheses and holding deeper interpretations of relationships or influences. (Muri *et al.*, 2014). Quantitative research was conducted to analyze the duration of Smartphone use to neck pain in students. Researchers only give questions, observations and documentation on the respondents without intervening or giving treatment to respondents. Based on the time of the research, this study included cross sectional study because independent variable (independent) is the duration of Smartphone usage and dependent variable (necked) that will be examined at the same time. This research was conducted at SMAN 01 Kraksaan Probolinggo on August 2017.

The population in this study are all students SMAN 01 Kraksaan Probolinggo which has a Smartphone with a total of 979 students. Calculation of the minimum sample size using the Slovin formula (Nazir, 2014) totally 91 students/respondents. In this study the sampling technique used is simple random sampling that is the selection or sampling / respondent members of the population done by randomized without looking at the strata in the population (Sugiyono, 2015). Researchers scramble the names of students who have a Smartphone without differentiating the class. After the name of the students reached 91 students, then the names - names that will be used as respondents.

Determining the sample size, that are:

$$n = \frac{N}{N \cdot d^2 + 1}$$

Explanation :

- n = Samples amount
- N = Population amount
- d = precision value

(Nazir, 2014)

In this study, it is known that the total population of 979 students with precision level is set at 10% , then the sample size are:

$$n = \frac{979}{979 (0.1)^2 + 1}$$

$$n = \frac{979}{979 (0.1)^2 + 1}$$

$$n = \frac{979}{9.79 + 1}$$

$$n = \frac{979}{10.79} = 90.732159 = 91$$

Data collection techniques in this study with questionnaires and documentation. Tools to obtain data derived from questionnaires that have been distributed to respondents to be answered in accordance with the circumstances or real conditions that exist in the respondent. Data analysis technique in this research is done with the help of computer application program by SPSS using statistical analysis of Univariate and Bivariate. Univariate analysis to describe the characteristics of each research variable (Sugiyono, 2015), ie sex, class, duration of Smartphone usage, neck pain, pain ranges, use / service on frequently used / used Smartphone, other health complaints while using a Smartphone and the kind of complaints that are felt when using a Smartphone. After univariate analysis, the result will be known the distribution of each variable, and can be continued Bivariate Analysis. Bivariate analysis to find the influence between independent variable and dependent variable by using statistical test. To find the effect of duration of Smartphone use to neck pain is used Bivariat *Chi-Square Analysis Test*.

### III. RESULT

In this section, the researcher will present the results and data analysis on "Effect Analysis of Duration of Smartphone Usage on Neck Pain on Students SMAN 01 Kraksaan Probolinggo". Data collection was done by using questionnaires sheet on Student SMAN 01 Kraksaan Probolinggo amount of 91 respondents.

#### A. Characteristics of Respondents by Sex

Table 1. Frequency Distribution of Respondents by Sex

Gender	Frequency	Percentage
Male	38	41.8
Female	53	58.2
Total	91	100.0

Based on table 1 that most of the respondents are female with 53 respondents (58.2%).

#### B. Characteristics of Respondents by Class

Table 2. Distribute Frequency Respondent Based on class

Class	Frequency	Percentage
X	20	22.0
XI	45	49.5
XII	26	28.6
Total	91	100.0

Based on table 2 that most of the respondents are class XI (eleven) with 45 respondents (49.5%).

#### C. Duration of Smartphone usage

Table 3. Respondents Frequency Distribution Based on Duration of Smartphone usage

Duration using Smartphone	Frequency	Percentage
low	20	22.0
Medium	34	37.4
High	37	40.7
Total	91	100.0

Based on table 3 that most respondents are of high duration when using a Smartphone with a total of 37 respondents (45.1%).

**E. Neck Pain**

Table 4. Distributed Frequency of Respondents Based on Neck Pain

Pain Smartphone usage	Frequency	Percentage
Not Pain	38	41.8
Pain	53	58.2
Total	91	100.0

Based on table 4 that most of the respondents were neck pain with the number of 53 respondents (58,2%).

**F. Range of Neck Pain**

Table 5. Frequency Distribution of Respondents Based on Range of Neck Pain

Pain Range	Frequency	Percentage
No pain	38	41.8
low	8	8.8
medium	21	23.1
high	16	17.6
Very high	8	8.8
Total	91	100.0

Based on table 5 that the majority of respondents were experiencing moderate neck pain with the number of 21 respondents (23.1%).

**G. Smartphone Usage**

Table 6. Frequency Distribution Based on Smartphone Usage

Smartphone Usage	Frequency	Percentage
Social Media	62	68.1
Game	14	15.4
Knowledge	13	14.3
Others	2	2.2
Total	91	100.0

Based on table 6 that most respondents using Smartphone are for social media (WA, FB, Line and any kinds of it) with amount of 62 respondents (68.1%).

**H. Other Health Complaints when using Smartphone**

Table 7. Respondents Frequency Distribution Based on Smartphone Usage Complaints

Smartphone usage complaints	Frequency	Percentage
No complaint	41	45.1
Complaint	50	54.9
Total	91	100.0

Based on table 7 that most respondents are no complaints when using a Smartphone with the number of 50 respondents (54.9%).

**I. Type of Complaints felt when using Smartphone**

Table 8. Respondents Frequency Distribution Based on Smartphone Usage Complaint Type

Smartphone usage grievance type	Frequency	Percentage
No complaint	41	45.1
Hand cramp / tingling	8	8.8
Eyes tired / hot	25	27.5
Dizzy	12	13.2
Others	5	5.5
Total	91	100.0

Based on table 8 that most respondents are complaining of tired / hot eyes when using a Smartphone with the amount 25 respondents (27.5%).



**J. The Effect of Duration of Smartphone Usage on Neck Pain**

Table 9. Distribution Duration of Smartphone Usage of Neck Pain

		Category of Pain			
		No pain	Pain	Total	
Duration using <i>Smartphone</i>	low	Count	16	4	20
		Expected Count	8.4	11.6	20.0
	Medium	Count	15	19	34
		Expected Count	14.2	19.8	34.0
	High	Count	7	30	37
		Expected Count	15.5	21.5	37.0
Total	Count	38	53	91	
	Expected Count	38.0	53.0	91.0	

Based table 9 in get the data that the respondents who used a low Smartphone duration with the number of 20 respondents, 16 respondents isn't got pain then 4 respondents are got pain. Respondents whose duration of use of Smartphone was with the number of 34 respondents, 15 respondents did not experience pain while 19 respondents had pain. Respondents whose duration of high Smartphone use with the number of 37 respondents, 7 respondents did not experience pain while 30 respondents experienced pain.

Table 10. Effect of Duration of Smartphone Usage on Neck Pain

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	20.040 <sup>a</sup>	2	.000	.000		
Likelihood Ratio	21.097	2	.000	.000		
Fisher's Exact Test	20.309			.000		
Linear-by-Linear Association	19.581 <sup>b</sup>	1	.000	.000	.000	.000
N of Valid Cases	91					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8,35.

b. The standardized statistic is 4,425.

Chi-Square Test obtained P value data 0.000 (<0.05) so there is influence duration of Smartphone use on neck pain.

**IV. DISCUSSION**

After seeing the results obtained and in doing the next data analysis will be discussed about several things, these are: 1) Level Duration of Smartphone usage at SMAN 01 Kraksaan - Probolinggo. 2) Neck Pain Complaints Smartphone using in SMAN 01 Kraksaan - Probolinggo and 3) Effect Duration of Smartphone usage of Neck Pain in SMAN 01 Kraksaan Probolinggo.

**A. Level of duration of student Smartphone usage in SMAN 01 Kraksaan – Probolinggo**

A study of internet addiction and Smartphone focusing on teenagers worldwide with 1,000 respondents ever conducted by the University of Maryland in 2012. During 24 hours respondents are prohibited from accessing the media. The results of the study found that 50% of respondents were not able to surpass due to feel anxious and isolated life without a Smartphone. Another study stated that before starting the activity 4 out of 5 people checked the Smartphone and 15 minutes after waking up nearly 80% of users checked the Smartphone. That's what can trigger the phenomenon of the occurrence of high duration / time in the use of Smartphone (Sarip H, 2014).

The result of the research was obtained 20 respondents (22%) using Smartphone with low duration, 34 respondents (37.4%) use Smartphone with medium duration, 37 respondents (40,7%) using Smartphone with high duration.

Not all respondents used high-duration Smartphone, as found in the research results that 20 respondents (22%) used Smartphone with low duration, as many as 34 respondents (37.4%) use Smartphone with medium duration, it showed that not all teenagers experience "addiction" Smartphone. There are some things that can cause a teenager / student is not "addicted" Smartphone, among others, when the students in the school prefer to social interaction, reading books, following extracurricular activities and so forth.

### **B. Neck Pain Complaints Smartphone usage in SMAN 01 Kraksaan – Probolinggo**

According to Peter Vi, 2000 (In Tarwaka, 2010), explains that there are several factors that can cause a complaint on the musculoskeletal system including pain, including the factor of workload is too large and repetitive activities. When using a Smartphone, most of the neck or head position of the individual bends / flexes to see the Smartphone screen. If the position is often done and with a long time (high duration) then produce considerable pressure on the cervical spine, resulting in stiffness (pain / discomfort) in the neck muscles and head (Bader K *et al.*, 2015).

Result of study showed that 38 respondents (41.8%) did not experience neck pain in Smartphone use and 53 respondents (58.2%) experienced neck pain in Smartphone use. Although most respondents (58.2%) experienced neck pain in Smartphone using, not all respondents had the same range of pain, it is shown in Table 3.5 that 8 respondents (8.8%) had mild pain, 21 respondents (23.1%) experienced moderate pain, 16 respondents (17.6%) had severe pain and 8 respondents (8.8%) had severe pain.

Respondents in this study did not all experience pain when using a Smartphone, proven 38 respondents (41.8%) did not experience pain in using a Smartphone. There are several factors that may cause some students to not experience neck pain when using a Smartphone, such as the intensity / duration of Smartphone use is not high, when using the Smartphone with the correct position of the head and eyes parallel to the Smartphone screen, using smart phones with adequate lighting.

In addition, the age factor also has a role to respond to pain. Chaffin (1979) and Guo *et al.*, (In Tarwaka) states that generally skeletal muscle complaints begin to be felt at the age of work, these are 25-65 years. The first complaints are usually felt at 35 years of age and the level of complaints will continue to increase with age. This happens because in middle age, muscle strength and endurance begin to decline so that the risk of increased muscle complaints. Riihimaki *et al.*, 1989 (In Tarwaka also explained that age has a very strong relationship with musculoskeletal complaints, especially for neck and shoulder muscles, even some other experts stated that age is the main cause of muscle complaints. Respondents in this study are all still in teenagers.

### **C. The Effect duration of Smartphone usage to neck pain in SMAN 01 Kraksaan – Probolinggo**

Based on the results of a study conducted at Sahmyook University Korea, a total of 20 students were divided into 10 students in heavy user group (high duration) Smartphone and 10 students in the non heavy user group (low duration) Smartphone. Both groups studied the threshold of pain relief on the trapezium muscle, sternocleidomastoid, craniovertebral angle, head angle position, and depression level. The results indicated by this study is the use of a heavy Smartphone (high duration) can produce considerable pressure on the cervical spine, thus changing the cervical curve and increasing pain threshold from the muscles around the neck (Park *et al.*, 2015).

From the results of this study indicate that there is influence duration of Smartphone use to neck pain in SMAN 01 Kraksaan – Probolinggo. However, not all students who use a Smartphone with a high duration will experience neck pain, it is shown data that from 37 respondents who use high Smartphone duration there are 7 respondents did not experience neck pain. But not for all students who use a Smartphone with a low duration does not experience neck pain, it is shown data that of 20 respondents who use low Smartphone duration there are 4 respondents who experienced neck pain.

Technology is created because it has benefits that can help or facilitate human in life. Wawan Syahroni (2015) revealed several benefits of the Smartphone, among others: as a communication tool, to search for information and science, entertainment facilities, store data and others. Although as a student, the respondents in this study mostly do not use Smartphone to seek or increase knowledge, this is indicated based on Table 6 that 62 respondents (68.1%) used *Smartphone* to communicate through social media (FB, WA, Line and any kinds), 14 respondents (15.4%) used *Smartphone* for game, only 13 respondents (14.3%) used *Smartphone* looked for knowledge, others 2 respondents (2.2%) used *Smartphone* for others (listening music, watching film and others).

In addition to having a positive impact, the use of Smartphone can also cause negative impacts in terms of health if the use is not appropriate. That is showed that 50 respondents (54,9%) have complaints other than neck pain, 41 respondents (45,1%) have no complaints on Smartphone usage. Some of the complaints felt by respondents in this study can be seen based on table 3.8 which stated that 8 respondents (8.8%) complained of cramps or tingling on their hands, 25 respondents (27.5%) complained of tired / hot eyes, 12 respondents (13.5%) complained of dizziness and 5 respondents (5, 5%) complained others (eyes increased minus, blurred vision, back and shoulders felt sore and fingers felt cramps).

## V. CONCLUSIONS AND RECOMMENDATION

### A. Conclusions

Duration using *Smartphone* in SMAN 01 Kraksaan – Probolinggo most are high. Using *Smartphone* in SMAN 01 Kraksaan – Probolinggo most are experiencing neck pain. There is an effect of the duration of Smartphone use to neck pain in SMAN 01 Kraksaan – Probolinggo.

### B. Recommendation

1. For using *Smartphone*: Expected when using the Smartphone with head / neck position does not bend and do not use Smartphone in the long term (high duration). When using a Smartphone with bright lighting so as not to cause negative effects on health.
2. For Educational Institutions (SMAN 01 Kraksaan): It is recommended to create rules that can reduce the duration of Smartphone use in the school environment. It is expected to provide information about the negative impact of Smartphone usage
3. For Parent: Can play an active role in monitoring and controlling the use of Smartphone against his son / daughter.

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