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The Relation Between Smartphone Use with Forward Head Posture Occurrence in Undergraduate Physiotherapy Student

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ABSTRACT

Introduction: College students use smartphones with a high level of use, high levels of smartphone use due to various purposes such as academic and non-academic needs, and prolonged use of smartphones with poor posture can cause permanent changes in posture to their users. One of the posture changes that can occur is the forward head posture (FHP).

Methods: The research design was a cross-sectional study conducted from August to December 2021 with a population of Udayana University Physiotherapy students who met the inclusion and exclusion criteria. The sampling technique in this study was purposive sampling, and obtained 62 samples. This study used the YourHour application and Web Plot Digitizer to measure the duration of smartphone use and the craniovertebral angle, respectively. Data were analyzed by SPSS 16.0 to determine the relationship between smartphone use with forward head posture occurrence in physiotherapy students.

Results: The majority of students who were in the research sample used smartphones with a high level of duration, as many as 46 samples; in 46 samples with a high level of duration found, 28 samples experienced forward head posture, in students with moderate and low duration levels, forward head posture is rare. The results of the chi-square obtained are p-value = 0.009. it indicates that there is a relationship between the dependent variable and the independent variable.

Conclusion: There is a relationship between the duration of smartphone conditions and forward head posture in students of the Physiotherapy Undergraduate Study Program, Faculty of Medicine, Udayana University. In this study, it can be seen that the forward head posture is the majority of smartphones with high intensity.

Keywords: College Student, Duration, Smartphone, Forward Head Posture.
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INTRODUCTION

College students are teenagers who are expected to be able to place themselves in the community as an independent learner. Students are individuals who are familiar with the social environment[1], so at this time, students often interact with the surrounding environment. One of the tools for social interaction is a cell phone or what we usually know as a smartphone.[2]

The adverse effects of smartphone use can vary, such as eye health problems, psychological disorders, and sleep disorders.[3] Smartphone also has an addictive effect that makes users want to continue to use a smartphone, even though there is no urgent need to use a smartphone.[4] One of the negative impacts that can be caused by using a smartphone for a long time is the forward head posture.[5,6]

Forward head posture is a position where the head tends to lean forward or not in line with the line of gravity.[6] FHP can interfere with daily activities because it can cause pain. Moreover, FHP can also cause a functional limitation or functional limitation of motion in the neck; limited movement is 3-dimensional movement, flexion, extension, and rotation.[7] The prevalence of forward head posture obtained from the literature of Lee & Seo et al. is 66% in the population aged 20-30 years.[8]

Using a smartphone for a long time can cause a forward head posture. When using a smartphone, the user's head position tends to hold the smartphone using one or both hands below eye level. To use a smartphone, the user will look down by flexing forward with the neck to maintain body balance. This position is called the anterior head approaching the vertical line from the center of gravity. If done for a long time, it can cause FHP.[9]

The incidence of forward head posture is mostly found in the elderly with impaired postures spinal such as kyphosis and scoliosis. Still, with the increasing popularity of devices such as laptops and smartphones, young users likely have the potential to experience forward head posture

events.[10,11] Students are young smartphone users with high-risk factors for developing forward head posture.[12,13] This study is vital for the Indonesian population because college students nowadays use their smartphones more often. After all, the smartphone has much utility.

The description that has been described above are the backgrounds to carry out further analysis of the relationship between the duration of smartphones and the incidence of forward head posture in Physiotherapy students, Faculty of Medicine, Udayana University. This research aims to find evidence-based result information for readers, especially students and physiotherapists.

METHODS

This study used a cross-sectional observational research method to examine the relationship between one variable and another, as indicated by the magnitude of the correlation coefficient. This research was carried out from August to December 2021. Sampling was carried out offline while still considering the applicable health protocols. The target population in this study is students of the Faculty of Medicine, Udayana University. The affordable population in this study were students of the Physiotherapy Study Program, Faculty of Medicine, Udayana University. The sample for this study was physiotherapy students batch 2018, 2019, and 2020 Faculty of Medicine, Udayana University, Denpasar, Bali.

The sample in this study was calculated using the solving formula.[14] First, the researcher determines the population, and then from the population, several subjects are selected that meet the inclusion criteria. After the subjects are collected, then sampling is carried out using the purposive sampling technique. From the sampling technique, obtained 71 samples which are willing to participate in the study. Still, because of the result of the sample formula, then nine people from the 71 samples become dropout criteria. The number of samples obtained was 62 people who met the inclusion and exclusion criteria of the study. The inclusion criteria in this study were students aged 19-21 years studying at the Physiotherapy Study Program, Faculty of Medicine, Udayana University, using a smartphone, and willing to voluntarily become a research sample from the beginning to the end of the study by signing informed consent as proof of approval. The exclusion criteria for this study were students who had clavicular and vertebral fractures, especially in the cervical region, in the last two months and those who had shoulder, neck, and back muscle injuries in the past month. The variables in this study include the independent variable, namely the level duration of smartphone use; the dependent variable, namely the forward head posture; and the control variable in this study is the age of the college students, namely the age of 19-21 years.

This study's smartphone use data was obtained through the YourHour developed by Mindefy Labs as a company. This application measures how long the user uses the smartphone application to make the measurement more accurate. After getting data in the form of numbers for the duration of use, the data will be categorized into low, medium, and high levels based on previous research.[3] Forward head posture in this study was obtained by analyzing the sample photo laterally to determine the degree of craniovertebral angle (CVA). CVA was measured using a measuring instrument called the Web Plot Digitizer, developed by Ankit Rohatgi as the creator. The Web Plot Digitizer has an intra-rater of 0.71-0.99, which indicates that this instrument is good and reliable for measuring neck posture.[15] These two variables were then processed using non-parametric statistical tests because both data were categorical, so the data were freely distributed and did not use the normality test. The statistical test used was the chi-square test with a significance level (α) of 5% or 0.05. Meanwhile, the univariate analysis in this study was age, duration of smartphone use, and forward head posture.

Before the study began, the sample was first explained the purpose of the study. Then the sample was instructed to sign an informed consent as evidence of being willing to be a sample during the study, after which smartphone sample YourHour to calculate the duration of smartphone use. Finally, the sample head will be photographed from the side to measure the degree of CVA.

This research has received approval from the Research Ethics Commission of the Faculty of Medicine, Udayana University / Sanglah Central General Hospital Denpasar. Ethical clearance/ information on ethical eligibility with number 1454/ UN14.2.2.VII.14/LT/2021. The study sample signed informed consent before the research procedure was carried out.

RESULTS

Characteristics of the Research Sample

Based on the data in table 1, it can be seen that the distribution of the sample is based on gender. The majority sample is female, with 39 samples (62.9%). The sample aged 21 years comprised 30 samples (48.4%), and the smartphone's high usage duration amounted to 46 samples (74.2%). For the

Table 1. General Characteristics of Research Subjects.

	Frequency (n)	Percentage (%)
Gender		
Male	23	37.1
Female	39	62.9
Age		
19 years	18	29
20 years	14	22.6
21 years	30	48,4
Duration of Smartphone		
Low	2	3.2
Average	14	22.6
High	46	74.2
Forward Head Posture		
Yes	28	45.2
No	34	54.8
Total	62	100.0

Table 2. Results of the bivariate chi-square test of smartphone usage duration to forward head posture occurrence.

Duration	Forward Head Posture		Total	*P*-value
	Yes	No		
Low	0	2	2	0.009
Average	2	12	14	
High	26	20	46	
Total	28	34	62	

distribution of forward head posture, 27 samples (44.3%) were found to have a forward head posture, while 34 samples (55.7%) did not have a forward head posture.

Analysis of the Relation between the Duration Level of Smartphone Use to Forward Head Posture on College Students

Table 2 shows the results of the chi-square test between variables. The p-value obtained through the chi-square test is 0.009, which means it is smaller than 0.05. These results indicate a relationship between the duration of smartphone use and forward head posture occurrence in students of the Physiotherapy Undergraduate Study Program, Faculty of Medicine, Udayana University.

DISCUSSION

Characteristics of the Research

The sample in this study was active students of the Undergraduate Physiotherapy Study Program, Faculty of Medicine, Udayana University, Denpasar, Bali, aged 19-21 years, and obtained 62 samples that met the inclusion and exclusion criteria. The high-level duration of smartphone use among students can be attributed to several factors, one of the factors that can make the intensity of smartphone usage high is online learning which has been implemented since the last two years due to the Covid-19 pandemic, the pandemic condition that has lasted for the last two years has caused students to use gadgets, coupled with a busy class schedule causing high exposure to samples.

The presence or absence of forward head posture in the sample was measured using a Web Plot Digitizer. The sample is said to have a forward head posture when the craniovertebral angle is below 48 degrees.[6,16] Based on data retrieval and measurement that has been done, it was found that 28 samples (45.2%) had forward head posture while 34 samples (54.8%) did not. The forward head posture in student smartphones is caused by the bad posture carried out continuously when using a smartphone. When using a smartphone, users tend to bow their heads to be able to focus on staring at the smartphone so that the degree of neck flexion increases and stress will move to the neck area.[17] This accumulated stress can later change the neck curvature slowly. If left unchecked, the neck will adapt to this bad posture and other complications, such as upper-cross syndrome, which is accompanied by the appearance of a forward head posture.[16,18]

The Relationship between the Duration of Smartphone Use and Forward Head Posture Conditions on Students

From the data obtained, it can be seen that as the duration of smartphones increases, there is an increased risk of posture disorders. Students who use smartphones with a high level of duration, as many as 46 samples, the majority have forward head posture, as many as 28 people students with moderate levels of usage duration, as many as 14 people, found two people who have forward head posture. In contrast, for students with a low duration level, there were no samples with forward head posture apart from the data obtained. This statement was also reinforced by Sugijanto (2015), which stated that the high intensity of using gadgets could cause neck disability and posture disorders.[19]

Wiguna researched similar variables in 2019 on several junior high school students in Denpasar. The results showed that the prevalence of FHP was 51.7% out of 56 samples, with the value of the data test results of p = 0.037 (p<0 0.05)[13], in addition to the research conducted by Ramalingam in 2019 on students of a university in Malaysia, the prevalence of FHP was 67% out of 188 samples, with the results of the data test being p = 0.000 (p<0.05).[20] Based on the p-values listed in these two studies, duration is related to the occurrence of the forward head

posture in the sample.

The manifestation of forward head posture begins with pain in the neck.[11,21] This pain appears if the subject uses a smartphone with a bad posture for approximately 3-4 months. In the next 4-6 months, the subject can feel symptoms of upper-crossed syndromes such as tightness in the pectoralis major and minor, rounded shoulders, weakness in the cervical flexors and lower trapezius muscles, if the upper crossed syndrome is left untreated and is not immediately corrected, two months later there will be weakness and elongation of the cervical semispinalis and shortening of semispinalis capitis.[22] Two changes in the length of the semispinalis will manifest a forward head posture in the neck. When viewed from the time when students use smartphones intensely, namely the last two years since online learning was implemented, coupled with the lack of physical activity such as sports that are carried out due to the tight class schedule, that time is sufficient to make the manifestation of forward head posture in the research sample which has a high duration of smartphones use.

The duration of smartphone use can influence the prevalence of forward head posture occurrence because smartphone use for a long time can cause changes in posture[23], changes in posture that are formed is an anterior curve in the lower cervical vertebrae and a posterior curve in the upper thoracic vertebrae which causes the head to lean more forward (forward) than the normal condition. In addition to changes in posture, smartphone overuse can cause long muscle overuse, which leads to strained neck muscles, and strained neck muscles causing other pathological conditions such as upper-cross syndrome, which is accompanied by a forward head posture. It can change the center of gravity of the body to be more anterior. In the end, the body experiences a posture imbalance which can cause a reduction in motor control in the body-field.[20] Based on this explanation, it can be concluded that the duration of using a smartphone has a relationship with the forward head posture because it can be a factor that can cause a person to be more at risk of having a forward head posture.

However, This study has a limitation. It does not carry out specific controls on the physical activity carried out by the sample every day, so it is possible that the results of this study cause bias. For future research, it is expected to carry out tight control on the physical activity of the sample. This study can be applied to another province in Indonesia other than Bali because all college students in Indonesia had almost the same lifestyle as the others.

CONCLUSION

This study concludes that there is a relationship between the duration of smartphone usage and forward head posture conditions in students of the Physiotherapy Undergraduate Study Program, Faculty of Medicine, Udayana University. In this study, it can be seen that the forward head posture is the majority of smartphones with high intensity. The results of this study are expected to be a reference for measuring neck posture and to find preventive actions that students or universities must take to prevent the occurrence of forward head posture in students.

ETHICAL CLEARANCE

The Commission for Research Ethics, Faculty of Medicine, Udayana University/Central Public Hospital Sanglah Denpasar stated that this study was ethically worthy under the number 1454/UN14.2.2.VII.14/LT/2021.

CONFLICT OF INTEREST

This study does not have any conflict of interest.

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AUTHOR CONTRIBUTIONS

GD, AAGAPN conceived the study design and data collection and drafted the manuscript; IVJ and NWT collected the data and revised the manuscript.

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