

## Association Between Neck Pain and Mobile Phone Usage Among University Students

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### ABSTRACT

Mobile phone is a must have gadget for university students. Many of them however reported of having neck pain as a result of using mobile phone. Previous studies have investigated the association between neck pain and mobile phone use, however the evidence on this association is still inconclusive. The aim of this study was to investigate the association between neck pain and mobile phone usage among university students. Fifty-two (19 men and 33 women) UKM undergraduate students aged between 18-25 years were recruited in this cross-sectional study. Neck pain was measured with Neck Pain and Functional Limitation Scale (NPFLS) and mobile phone usage was measured with mobile phone use questionnaire. Time spent on mobile phone ( $\beta=0.29$ ), using mobile phone with both hands ( $\beta=0.40$ ), and negative impact of lack of back support, neck and forearm support on neck pain ( $\beta=-0.50$ ) were significantly associated with risk of neck pain. Therefore, it is concluded that increasing time spent on mobile phone with incorrect posture and ergonomic may contributed to neck pain among university students.

Keywords: neck pain, association, mobile phone, university students

### Abstrak

Telefon bimbit merupakan gajet yang wajib dimiliki oleh semua untuk pelajar universiti. Kebanyakan mereka bagaimanapun dilaporkan mengalami sakit leher akibat menggunakan telefon bimbit. Walaupun banyak penyelidikan telah menyiasat hubungkait antara kesakitan leher dan penggunaan telefon bimbit, bukti mengenai hubungkait ini masih tidak dapat diselesaikan. Tujuan kajian ini adalah untuk mengkaji hubungkait antara kesakitan leher dan penggunaan telefon bimbit di kalangan pelajar universiti. Pelajar berumur 18-25 tahun dari Universiti Kebangsaan Malaysia (UKM) telah direkrut dalam kajian keratan rentas ini. Kesakitan leher diukur dengan Neck Pain and Functional Limitation Scale (NPFLS) dan penggunaan telefon bimbit diukur dengan soal selidik penggunaan telefon bimbit. Masa yang diperuntukkan untuk telefon bimbit ( $\beta = 0.29$ ), menggunakan telefon bimbit dengan kedua tangan ( $\beta = 0.40$ ), dan kesan negatif dari kekurangan sokongan tulang belakang, leher dan sokongan lengan pada kesakitan leher ( $\beta = -0.50$ ) berhubungkait secara signifikan dengan risiko sakit leher. Oleh itu, disimpulkan bahawa peningkatan masa yang digunakan untuk telefon bimbit dengan postur yang salah dan tidak ergonomik boleh menyebabkan kesakitan leher di kalangan pelajar universiti.

### INTRODUCTION

Neck pain is a very common health problem worldwide (Fejer 2006). It can be defined based on anatomical location, aetiology, severity and duration of symptoms (Fejer 2006). For duration of symptoms, acute neck pain is defined as symptoms occurring for less than 7 days. Subacute neck pain is symptomatic for 7 days to 3 months, whilst chronic neck pain refers to symptoms occurring for more than 3 months (Misailidou 2010). Neck pain has been ranked as the number four greatest contributor to global disability after low back pain, major depressive disorder and iron deficiency (Hoy 2014). Neck pain also affects an individual's productivity by hindering them from going to work or school (Ariens 2002). Considering nearly 50% of adults will likely experience neck pain at least once in their life (Fejer 2006), neck pain should be regarded as an important public health concern.

Neck pain occurrence among university students had been reported to be high in various populations. For example, in Ireland, 53% of university students were reported to have neck pain (Dockrell 2015). The prevalence of neck pain among university students in Thailand was also considerably high (46%) (Kanchanomai 2011). Past study conducted in Malaysia also showed that the prevalence of neck pain among college students was almost similarly high (41.8%) as compared with those reported in Thai students (Alshagga et al. 2013). The factors contributing to neck pain among university students were multifactorial (Xie et al. 2017). However, computer and mobile phone usage were found to be more strongly correlated compared to other factors such as gender, history of trauma and family history of neck pain (Alshagga et al. 2013).

The association between mobile phone usage and musculoskeletal pain (Syamala et al. 2018, Xie et al. 2017) exists due to awkward

posture and prolonged duration of using mobile phone. However, majority of these studies that present association between neck pain and mobile phone usage did not focus on undergraduate students. In fact, only one study by Alshagga et al. (2013) that focused on undergraduate students. As it is evident now that the prevalence of neck pain is high among undergraduate students and with majority of them using mobile phone as everyday routine, it is therefore crucial to find whether is there any association between mobile phone usage and neck pain among this population.

In this era, mobile phone usage is very common and important among university students, whereby mobile phone messaging is the primary mode of communication especially with their peers and lecturers. Neck pain is associated with text messaging and it occurs as a result of constant 40° flexion of neck; an angle which is significantly higher in comparison to other activities involving mobile phone such as web browsing and video watching (Lee et al. 2015). People with neck pain showed higher muscle activities of the cervical erector spinae and upper trapezius when performing texting and typing tasks with mobile phone as compared to people with no neck pain (Xie et al. 2016). Commonly, people use one hand when typing message in their phone. Unilateral typing has been associated with higher muscle loading especially in the forearm muscles compared to bilateral texting (Xie et al. 2016). Texting with mobile phone result in higher tension in neck extensor and thumb muscles, lower activity in upper and lower trapezius in comparison with computer typing (Xie et al. 2016).

At the current level of knowledge, neck flexion, frequency of phone calls, mobile phone usage more than two hours and texting in sitting position without back and forearm support are known to be risk factors of neck pain. Frequency of phone call had been associated with neck pain (Hegazy et al. 2016). Mobile phone usage of more than two hours per day significantly increased the prevalence of neck-shoulder pain (Shan et al. 2013). Young adults with neck pain tend to flex their neck more than 40° and sit without back and forearm support when texting using mobile phone (Gustafsson et al. 2011).

There is a rise in number of studies focusing on effect of using mobile phone on neck pain. However, the association between mobile phone usage and neck pain among undergraduate students is still unclear especially in terms of posture, duration and human-device interaction.

The results of this current study would strengthen the evidence regarding factors associated with neck pain among university students such that preventive measures can be implemented in the future.

## **MATERIALS AND METHODS**

### **Research design**

A cross-sectional study was conducted among Universiti Kebangsaan Malaysia (UKM) undergraduate students. Simple random sampling method was used involving undergraduate students UKM Kuala Lumpur campus.

### **Population and sample**

UKM undergraduate students aged between 18-25 years old, with or without neck pain were recruited in this study. Those with neck pain caused by mechanical trauma such as whiplash and accident and those diagnosed as having spinal cord injuries, inflammatory disease and trauma at neck area or underwent any neck surgery were excluded from this study.

### **Instruments**

Two instruments were used in this study, which were Neck Pain and Functional Limitation Scale (NPFLS) and mobile phone use questionnaire. NPFLS was used for evaluation of neck pain and related disability. It consists of five domains: pain intensity, activities of daily living, social activities, functional activities and psychological factors. It consisted of 20 questions; 4 questions for each domain. NPFLS has a high concurrent validity of  $r=0.916$  and good reliability of  $r=0.948$  (Leonard et al. 2009). Mobile phone use questionnaire was adapted from the study by Gustafsson et al. (2011) with inclusion of questions asking about duration of mobile phone use instead of computer use, distance from eyes when using mobile phones, and support of forearm as well as support of back when using mobile phones.

### **Ethical considerations**

This study was approved by the Research Ethics Committee of Universiti Kebangsaan Malaysia (JEP-2019-167).

### **Data collection**

Recruitment of participants was done via social media such as Facebook and WhatsApp. Participants who interested to involve in this study contacted researchers (EWZS) for assessment date and brief explanation regarding the study

were given through phone. On the day of assessment, participants were asked to sign the informed consent and then were asked to fill in the questionnaires.

mobile phone usage and neck pain. The significant level of the data was set at  $p < 0.05$ .

## RESULTS

### Data analysis

All data were documented using Microsoft Excel spreadsheet and was analysed using ADANCO version 2.1.1. Social demographics such as age and gender were analysed using descriptive analysis. Structural equation modelling (SEM) was used to analyse the relationship between

### Characteristics of participants

The demographic characteristics of the participants are shown in Table 1. There were 52 participants involved in this study (19 males and 33 females) and the age of participants ranged between 20 to 24 years old.

Table 1. Participants demographic characteristics (N=52)

Demographic	N (%)	
Age	20	14 (26.9)
	21	15 (28.8)
	22	4 (7.7)
	23	18 (34.6)
	24	1 (1.9)
Gender	Male	19 (36.5)
	Female	33 (63.5)

Table 2. Neck Pain and Functional Limitation Scale (NPFLS)

Domain	Component	Mean	Total
Pain intensity	Rating	0.92	4.04
	Duration	1.15	
	Ability to manage	1.12	
Activities of daily living (ADL)	Toleration	0.85	1.13
	Dressing	0.21	
	Head turning	0.21	
	Television watching	0.31	
Social activities	Carrying	0.40	0.88
	Shopping	0.17	
	Family relationship and interaction	0.13	
	Travel	0.23	
Functional activities	Recreational activities	0.35	2.15
	Look up above head level	0.35	
	Reading	0.62	
	Work	0.56	
Psychological factors	Phone using	0.63	1.65
	Sleep	0.40	
	Ability to concentrate	0.52	
	Feeling of anxiousness	0.42	
	Feeling of depression	0.31	
			9.87

Table 2 tabulates the NPFLS scoring of participants. The mean score of NPFLS was 9.87. Pain intensity domain had the highest mean score

(4.04) while social activities domain had the lowest mean score (0.88).

Table 3. Mobile phone use questionnaire

Question	Answer option	N (%)
Owns a phone	Yes	52 (100)
	No	0 (0)
Time spent on phone	0 – 2 hours	0 (0)
	2 – 4 hours	6 (11.5)
	4 – 6 hours	22 (42.3)
	6 – 8 hours	11 (21.2)
	> 8 hours	13 (25)
Number of messages	0 – 25 messages	6 (11.5)
	25 – 50 messages	10 (19.2)
	50 – 75 messages	12 (23.1)
	75 – 100 messages	7 (13.5)
	> 100 messages	17 (32.7)
Time browsing	0 – 15 mins	1 (1.9)
	15 – 30 mins	7 (13.5)
	30 – 45 mins	16 (30.8)
	45 – 60 mins	7 (13.5)
	> 60 mins	21 (40.4)
Time for social media	0 – 30 mins	2 (3.8)
	30 – 60 mins	11 (21.2)
	60 – 90 mins	12 (23.1)
	90 – 120 mins	13 (25)
	> 120 mins	14 (26.9)
Time for entertainment or gaming	0 – 30 mins	15 (28.8)
	30 – 60 mins	10 (19.2)
	60 – 90 mins	14 (26.9)
	90 – 120 mins	8 (15.4)
	> 120 mins	5 (9.6)
Use of hand(s)	Both hands	39 (75)
	One hand	13 (25)
Distance of phone from eyes	< 10 cm	5 (9.6)
	10 – 20 cm	31 (59.6)
	20 – 30 cm	13 (25)
	> 30 cm	3 (5.8)
Back and neck support	Yes	28 (53.8)
	No	24 (46.2)
Forearm support	Yes	24 (46.2)
	No	28 (53.8)

Table 4. Summary of R<sup>2</sup>

Construct	Coefficient of determination, R <sup>2</sup>	Adjusted R <sup>2</sup>
Pain Sum	0.3737	0.2395
ADL Sum	0.2366	0.0730
Social Sum	0.2760	0.1209
Fx Sum	0.3225	0.1773
Psy Sum	0.3582	0.2207

Participant responses for mobile phone use questionnaire are summarised in Table 3. All participants owned a mobile phone and 42% of them used mobile phone 4 to 6 hours per day. About 33% of them sent more than 100 messages per day and 40% of the participants spent more

than one hour per day on web browsing using mobile phone. Whilst 27% of participants spent more than two hours on social media every day, and 28% of them spent less than 30 minutes per day on entertainment and gaming. The results showed that 75% of participants used mobile

phone with both hands. Majority of the participants (60%) held mobile phone 10 to 20 cm from eyes. Approximately 54% of participants used mobile phone with back and neck supported, while 54% of participants used mobile phone without forearm support.

### Structural equation modelling

Structural equation modelling (SEM) was used in this study to predict the impact of mobile phone use on various aspects of neck pain as in NPFLS. Graphical presentation of SEM can be viewed at Figure 1. Summary of coefficient of determination, R<sup>2</sup> is shown in Table 4. The most related combination is mobile phone usage and neck pain intensity, whereby 37% of changes in

neck pain intensity can be explained by the change in mobile phone usage. The least related combination was mobile phone usage and neck pain disability in terms of activities of daily living (ADL), with only 24% changes in ADL disability explainable by the changes in mobile phone usage.

Table 5 summarises the path coefficient of the model. The most positive significant coefficient was observed for using mobile phone with both hand and pain intensity ( $\beta=0.40$ ,  $p<0.01$ ). Conversely, the most negative significant coefficient was presence of back and neck support versus pain intensity ( $\beta=0.50$ ,  $p<0.01$ ).

Table 5. Path coefficient

Independent variable	Dependent variable				
	Pain intensity	ADL	Social	Functional	Psychological
Time	0.2882*	-0.0962	-0.1300	-0.0675	0.0443
Text	-0.1170	-0.0978	-0.2005	-0.2493	-0.2582
Browsing	-0.0876	-0.0772	0.0994	0.0257	-0.0572
Social media	0.1447	0.1970	0.2270	0.0812	0.1294
Fun/game	-0.0032	0.0200	0.0385	0.0761	0.1287
Hand	0.3952**	0.1666	0.2863*	0.2702*	0.3530**
Distance	-0.0071	-0.1446	-0.1837	-0.2186	-0.1176
Support	-0.5050**	-0.3128*	-0.0552	-0.3247*	-0.3743**
Forearm	0.0466	-0.2350	-0.3756**	-0.1590	-0.1364

\*Significant p-value <0.05, \*\*significant p-value <0.01

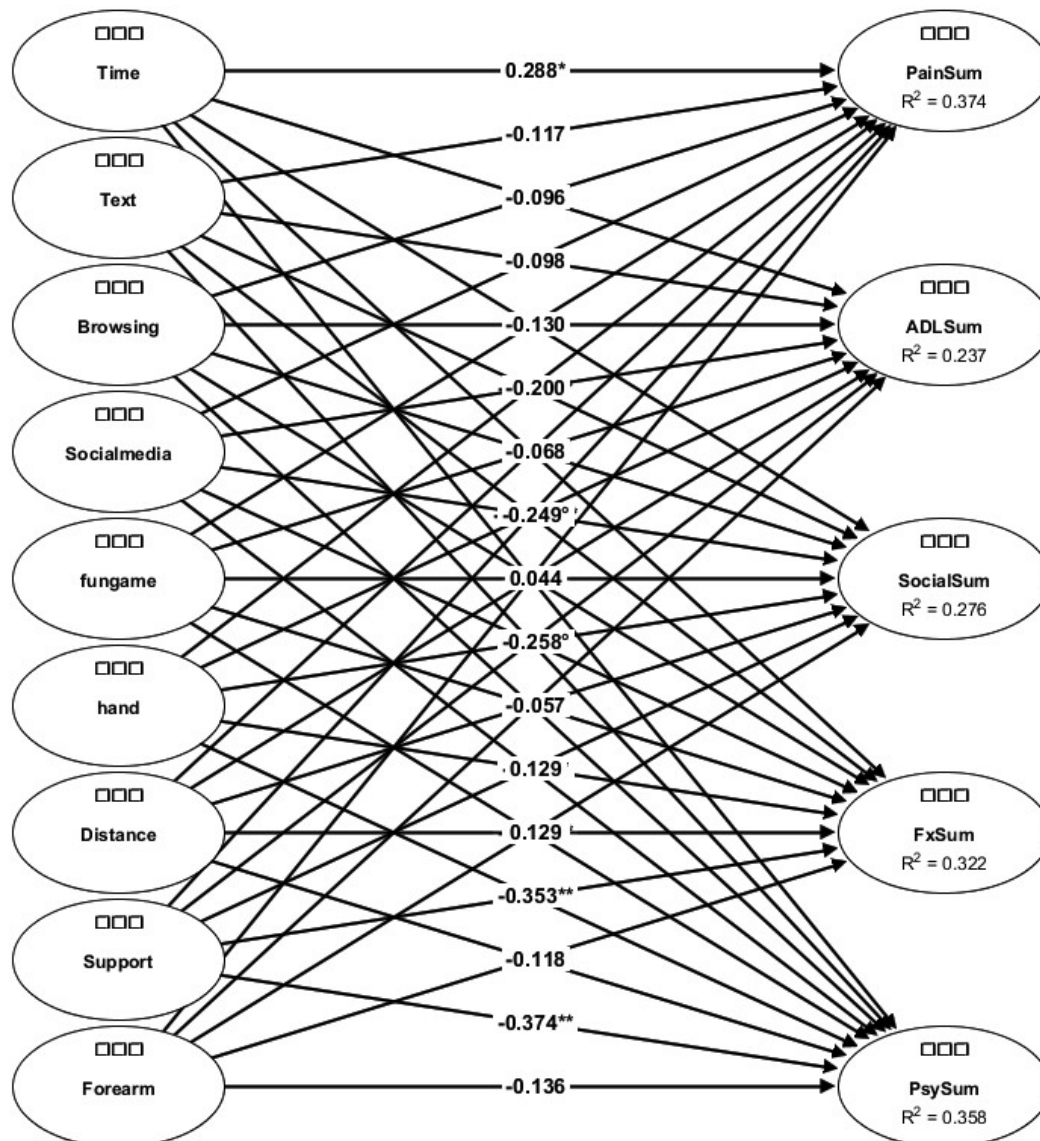
## DISCUSSION

The main finding of this study is that three factors were found to be predictors of neck pain related to mobile phone usage among undergraduate students. The factors were (i) time spent on mobile phone, (ii) using mobile phone with both hands, (iii) lack of back, neck support as well as forearm support. Time spent on mobile phone was found to be a risk factor of neck pain in several previous studies (Berolo et al. 2011, Hegazy et al. 2016, Stalin et al. 2016). Berolo et al. (2011) found significant association between total time spent using mobile device and pain in the neck and right shoulder among 140 university students and staffs. Hegazy et al. (2016) found that number of phone calls per day increased the odds ratio of neck pain among 472 university students. Stalin et al. (2016) conducted a community-based cross-sectional study among 2121 participants and

found that mobile phone usage was not only associated with neck pain but also other health problems such as headache, earache, tinnitus, painful fingers, morning tiredness, fatigue, eye symptom, sleep disturbance and restlessness.

A previous study showed that using mobile phone with both hands was associated with increased static cervical flexion (Xie et al. 2018). This agrees with another previous study which found that people with neck pain used mobile phone with neck flexion of 40° (Gustafsson et al. 2011). Therefore, it can be said that using mobile phone with both hands was associated with increased cervical flexion related to neck pain. In short, the result of this current study is parallel with previous study that showed using mobile phone with both hand increases neck pain. However, the study by Xie et al. (2018) found that using mobile phone with single hand is correlated to asymmetric neck posture.

Figure 1. Graphical presentation of the model



This study also found that lack of back, neck and forearm support is a risk factor of neck pain among university students. This result is consistent with previous study by Gustafsson et al. (2011) who found that young adults with neck pain symptom tended to sit with head flexion of more than 40°, without back and forearm support. This might be due to slump sitting happening in the absence of back support, which contribute to greater head/neck flexion and increased cervical erector spinae (CES) muscle activity (Caneiro et al. 2010). Higher CES and upper trapezius muscle activity were found among people with neck pain (Xie et al. 2016). Therefore, using mobile phone without back, neck and forearm support is not recommended for university students since it increases the risk of getting neck pain.

This study was limited by a small sample size and therefore may not suitable to be generalised to overall student population. Regardless of the limitation, this study add to the knowledge of current evidence on increasing time spent on mobile phone, using mobile phone with both hands, using mobile phone without back, neck and forearm support as risk factors of neck pain among university students.

## CONCLUSIONS

This study found that using mobile phone with both hand, increased duration of using mobile phone, using mobile phone without back, neck and forearm support are the risk factors for neck pain among university students. Therefore,

university students are advised to reduce time spent on mobile phone, and to use mobile phone with single hand as well as in the presence of back, neck and forearm support.

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