



Research article

The prevalence of bad posture and musculoskeletal symptoms originating from the use of gadgets as an impact of the work from home program of the university community

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ABSTRACT

During the COVID-19 pandemic, the Universitas Indonesia (UI) implemented a work from home program (WFH) to curb the spread of the coronavirus, as the use of gadgets including mobile phones and tablets were becoming prolonged and more frequent. As a result, musculoskeletal symptoms in certain limbs due to awkward posture sprang up. Therefore, the aim of this study was to quantify the degree of the use of these devices among UI community during the WFH initiative, as well as to identify musculoskeletal complaints resulting from defective postures. Consequently, this cross-sectional survey employed an online-based questionnaire, and the minimum number of respondents was 1080, as calculated using Slovin Formula. Meanwhile, a total of 1083 individuals, including lecturers (118), students (709), and managerial staff (256), obtained from 14 faculties, three schools, as well as administrative centres, volunteered to respond to the online poll. Apparently, 95% of the scholars owned mobile phones while only 16% possessed tablets, and 56% had used phones for over 10 years. The typical posture when using mobile devices was a reclining position on a sofa or mattress for a duration of 1–3 h as recounted by 34.6%. Also, sitting at a table for less than 30 min was reported by 25.3% of the subjects who used tablets. Furthermore, 70.5% of the respondents complained of musculoskeletal discomfort, particularly in the neck (86.4%), lower back (75.9%), and right & left shoulders (76.2%). In addition, the postures significantly related to these grievances included sitting at a table, alongside a prone position whilst using a mobile phone, as well as a latent or floor-sitting posture when using a laptop, whether at a table or not. Therefore, it is essential to do stretching, limiting usage time, look away every 20 min at an object that is about 20 feet away for a full 20 s when using a gadget and having adequate rest time to reduce musculoskeletal complaints.

1. Introduction

About 4.77 billion users globally were estimated to use mobile phones in 2017, a figure predicted then to rise to 5 billion, or roughly 67% in 2019 [1]. According to data obtained from Hootsuite, the population of phone operators reached 177.9 million users with a penetration rate of 67% in 2018 [2], and difficulty has been expressed to arise presuming the retraction of these devices, specifically in Indonesia were to occur. Seemingly, the functions of these gadgets have advanced to smartphones,

pertaining to the unification of various features of communication consequently preventing the limitation of these devices to calling or sending text messages, but as tools to simplify daily activities, involving e-commerce, teleconferencing, alongside e-learning, attributable to the variety of facilities offered.

As a consequence of the COVID-19 pandemic, the University of Indonesia enacted the work from home program (WFH) for all of the fellows, including lecturers, academic staff, and students as a method of the prevention of the spread of the disease. This institution represents

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one of the largest public universities in Indonesia, consisting of 14 faculties with a lecturer count of 2414, 2287 educational personnel, and 46,771 students [3]. As a result of the execution of this policy, the extent and rate of smartphone and tablet use, besides as well as laptop, among this populace increased, with a simultaneous surge in disorders of the muscle including the back, legs, and wrists triggered by bad posture while using these devices.

Subsequently, data from previous studies generally indicate the dramatic increase in the incidence of muscular disorders brought about by touchscreen-based mobile devices [4], an observation also supported by other researches demonstrating postural problems affecting the upper body, commonly encountered by users of these devices [5, 6]. Furthermore, in accordance with a study conducted by Kennet Hansraj from the New York Spine Surgery & Rehabilitation Medicine [7], the underlying health problems experienced by these individuals are usually more specific to the cervical spine (neck). This part of the skeletal network contains a pathway connecting regions of the brain to other parts of the body, hence, conditions occurring in this section represent critical health problems requiring strict prevention.

Therefore, the aim of this research was to identify unhealthy postures assumed during the use of these gadgets in the UI community in the course of the WFH program, and how to report related discomforts.

2. Methods

This study is descriptive analysis with cross-sectional design study that utilized an online-based questionnaire adopted from the University of Queensland in Australia to gather data on gadget usage and musculoskeletal conditions. Meanwhile, the establishment of the questionnaire was based on previously developed questions in literature [8, 9, 10, 11, 12, 13, 14, 15, 16], consisting of demographic and smart phone information, as well as the duration of use in relation to work, posture; as independent variables; and the skeletal symptoms as dependent variable.

Furthermore, the minimum sample size was 1080 respondents, according to the total population of the academics involving 51,472 people, consisting of 244 lecturers, 2287 educational staff, alongside 46,771 students, estimated based on the Slovin formula. Additionally, the information was amassed by way of stratified random sampling to ensure a proportionate representation of all the respondent units. This research received clearance from the Research and Community Engagement Ethical Committee, Faculty of Public Health Universitas Indonesia with number 109/UN2.F10.D11/PPM.00.02/2020. This study complies with all regulations and informed consent was obtained from participants. Data analysis employed the chi-square test with the statistical program IBM SPSS statistics version 24.

3. Results

The WFH policy was enforced by the UI in March 2020, and the survey performed in the early periods of May 2020. The data was

Table 1. Respondents characteristics.

Demographic Characteristics	Frequency (N = 1083)	Percentage (%)
Gender		
Men	370	34.1
Women	715	65.9
Age		
≤20 years old	340	31.3
21–30 years old	382	35.2
31–40 years old	171	15.8
41–50 years old	119	11.0
51–60 years old	54	5.0
>61 years old	19	1.8
Faculty		
Medicine	71	6.5
Dentistry	113	10.4
Public Health	277	25.5
Nursing	43	4.0
Pharmacy	15	1.4
Mathematics & Natural Sciences	51	4.7
Engineering	74	6.8
Computer Science	21	1.9
Law	23	2.1
Economics and Business	30	2.8
Humanities	105	9.7
Psychology	68	6.3
Social and Political Science	53	4.9
Administrative Science	25	2.3
University Administration Center	71	6.5
Vocational	30	2.8
School of Environmental Science	4	0.4
School of Strategic and Global Studies	11	1.0
Occupation		
Lecturer	118	10.9
Vocational Student	20	1.8
Profession Student	17	1.6
Bachelor Student	475	43.8
Magister Student	180	16.6
Doctoral Students	17	1.6
Research Centre Staff/Research Center	19	1.8
Educational Staff (Staff at the Faculty Unit/ Secretariat Department)	239	22.0

collected from 1107 candidates, and after cleaning data, it reduced to 1083, a figure nevertheless appropriate. The details of the examinees, composed of 118 Lecturers, 709 Students as well as 256 Administrative personnel were obtained from 14 faculties, 3 schools, alongside the directorial facility.

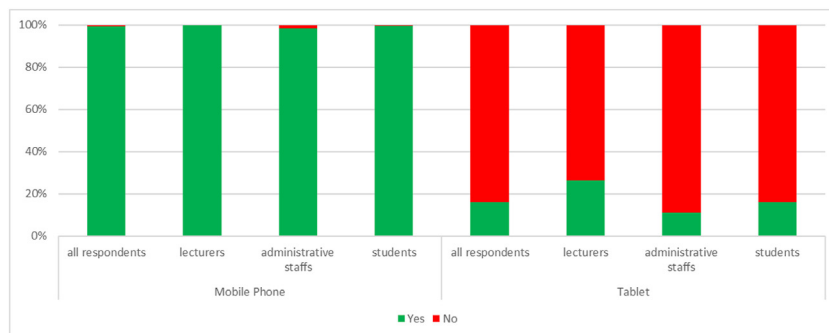


Figure 1. Gadgets and Laptops Used in The UI Civitas academics.

3.1. Respondents characteristics

A higher fraction, at 65%, of the respondents were women, and 35.2% were aged between 21-30 years, and the distribution relatively proportional for each faculty, as well as the type of position as illustrated in Table 1.

3.2. Gadgets used

Nearly all the community (>95%) use smartphone in the performance of daily activities. However, majority of do not use tablets (Figure 1).

The length of time mobile phones were used was estimated to be the longest, having been utilized for more than 10 years by 56.7% of the respondents. Furthermore, majority of the tablets' use was below 5 years (51.1%), considering the lack of users. Details can be seen in Table 2.

3.3. Posture during gadgets and Laptops Used

The postures assumed in the course of gadget use are seen in Table 3. The results demonstrated by 34.6% to be the most common position when using the cellphone was a supine position on a sofa or mattress for a period of 1–3 h, followed by sitting at a table reported by 27.3% for 1–3 h.

3.4. Musculoskeletal complaints

Complaints of musculoskeletal origins were recounted by 70.5% of the total respondents, with a majority of the reports said to affect the neck (86.4%), lower back (75.9%), and right and left shoulders (76.2%), as seen observed in Figure 2.

4. Discussion

The increasing speed and depth of the internet represents a key reason for the continuously progressive durations and frequencies expended on gadget use. A survey executed by Jacob Pausher (2016) in 2015, discovered three-quarters of adults in 40 countries procured access to the internet at least once a day, and several times daily in some countries [17], and also, the social media was more often perused in developing countries than in developed countries. Study by Benden et al. in 2021 also showed that smartphones as their most frequently used technology (64.0%), followed by laptops and tablets (both 53.2%), and desktop computers (46.4%) [18]. In addition, as observed by Alzhrani et al. in 2019, 97.5% of 398 university employees and research students used smartphones for both work and personal reasons (72.1%), 1.8% for work alone, and 23.6% for personal use only [19]. From the results of this study, a similar conclusion can be assumed for all UI community as approximately 100% possess smartphone, while a fraction of 16% owned tablets. Furthermore, about 56% of the respondents have used mobile phones for greater than 10 years, and the purpose of these devices was primarily for browsing, alongside skimming social media.

Additionally, the risks of negative health effects, particularly pains arising from bad postures, became greater with increased visits, as well as durations spent on these gadgets. Consequently, the outcomes of previous studies from Berolo et al. (2011), after the analysis of 140 respondents consisting of university students, staff, and faculty members

Table 2. Usage period of gadgets and laptops.

Usage Period	Mobile Phone		Tablet	
	N	%	n	%
≤5 years	65	6	89	51.1
6–10 years	402	37.3	67	38.5
>10 years	611	56.7	18	10.3

Table 3. Postures assumed during Gadget use.

Posture	Mobile Phone		Tablet	
	N	%	N	%
Laying down on the sofa/mattress				
Never	75	7.0	75	43.1
Rarely (<30 min)	188	17.4	48	27.6
Sometimes (30 minutes-1 hour)	223	20.7	17	9.8
Usually (1–3 h)	373	34.6	24	13.8
Always (>3 h)	219	20.3	10	5.7
Standing with the table as support				
Never	477	44.2	136	78.2
Rarely (<30 min)	456	42.3	32	18.4
Sometimes (30 minutes-1 hour)	112	10.4	4	2.3
Usually (1–3 h)	30	2.8	1	0.6
Always (>3 h)	3	0.3	1	0.6
Standing without the table as support				
Never	254	23.6	133	76.4
Rarely (<30 min)	589	54.6	36	20.7
Sometimes (30 minutes-1 hour)	166	15.4	4	2.3
Usually (1–3 h)	62	5.8	0	0
Always (>3 h)	7	0.6	1	0.6
Sitting on the floor				
Never	137	12.7	50	28.7
Rarely (<30 min)	265	24.6	57	32.8
Sometimes (30 minutes-1 hour)	318	29.5	41	23.6
Usually (1–3 h)	264	24.5	22	12.6
Always (>3 h)	94	8.7	4	2.3
Sitting with the table as support				
Never	112	10.4	28	16.1
Rarely (<30 min)	265	24.6	44	25.3
Sometimes (30 minutes-1 hour)	293	27.2	38	21.8
Usually (1–3 h)	293	27.2	43	24.7
Always (>3 h)	115	10.7	21	12.1
Sitting without the table as support				
Never	146	13.5	67	38.5
Rarely (<30 min)	385	35.7	67	38.5
Sometimes (30 minutes-1 hour)	310	28.8	26	14.9
Usually (1–3 h)	181	16.8	11	6.3
Always (>3 h)	56	5.2	3	1.7
Laying on the stomach				
Never	297	27.6	65	37.4
Rarely (<30 min)	338	31.4	34	19.5
Sometimes (30 minutes-1 hour)	212	19.7	41	23.6
Usually (1–3 h)	168	15.6	22	12.6
Always (>3 h)	63	5.8	12	6.9
Walking				
Never	375	34.8	146	83.9
Rarely (<30 min)	565	52.4	23	13.2
Sometimes (30 minutes-1 hour)	105	9.7	3	1.7
Usually (1–3 h)	26	2.4	2	1.1
Always (>3 h)	7	0.6	0	0

discovered an incidence of 84% pain of any severity in at least one region of the body, with the most pain occurring in the right hand, specifically in the thumb [9]. Also, Alzhrani et al., 2019 recorded the ergonomic hazards during the use of cellphones and tablets, where 80.1% complained of musculoskeletal discomfort, especially in the neck (64.7%), back (53.8%), and dominant shoulder (38.8%) [19]. Blair et al. (2015) also reported 67.9% musculoskeletal symptoms, mostly in the neck (84.6%) and upper back/shoulder areas (65.4%). Moreover, results of this study, indicated 70.5% complained of musculoskeletal discomfort, especially in

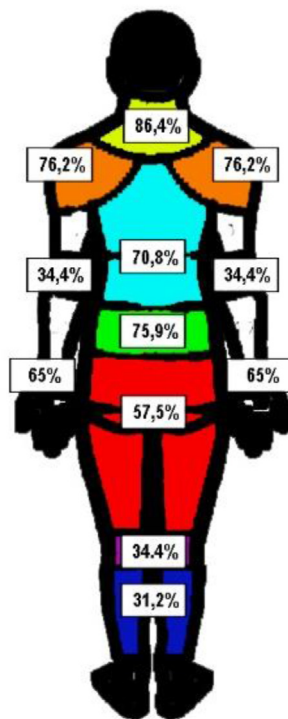


Figure 2. Bodymap musculoskeletal complaints.

the neck (86.4%), lower back (75.9%), and right and left shoulders (76.2%). Similarly, research from Olayinka *et al.* (2013) performed on 400 undergraduate laptop users at Obafemi Awolowo University in Nigeria, discovered 75.7% complained about the shoulder, comparable to the products of this investigation where reports on the shoulders were around 75–76% [20]. Eugenia *et al.* in 2016 also found that 251 (49.9%) respondents reported upper limb musculoskeletal symptoms, particularly in the neck and shoulder regions [21].

Therefore, gatherings from this study indicated the origin of most musculoskeletal discomforts to be the static posture adopted while using gadgets. The postures were detected, such as sitting at a table, prone, sleeping, alongside floor-sitting posture irrespective of whether a table was employed while using phones and tablets. However, a systematic review presented by Toh, S.H. *et al.*, in 2017 about mobile touch screen devices' (MTSDs) operators alleged the amount, features, tasks and positions of device use had limited evidence regarding musculoskeletal symptoms and exposures [22]. Study by Benden also showed that the participants were more likely to adopt non-traditional workplace postures as they used these devices primarily on the couch or at a chair with no desk [18].

Complaints about the neck were the most discomfort reported by the UI community while operating electronic gadgets, as a consequence of the neck posture assumed while staring at screens or monitors during the use of these devices. Moreover, with bad positions, for instance, while sleeping on the stomach, the screen is located below, with the neck accordingly strained. A survey of 300 students within the ages of 20–30 years by Rafiee *et al.* who used laptops at work or school in Tehran, Iran discovered 77.3% of users complained about the musculoskeletal aches in the neck (60.3%), wrist (27.3%) and right shoulder (26%) [23]. Meanwhile, Harsh Gupta in 2018, also revealed the basic health problem associated with the use of smartphones was related to Cervical Spine Stress arose from the prolonged declination of the neck while viewing the screen of the device [24], as the neck received more weight when bent due to an increased angle. Consequently, when an adult's head is placed in a neutral position or directed straight ahead, the weight amounts to about 10–12 pounds. Furthermore, a downward gaze 15°, increases the to 27 pounds, 40 pounds at 30°, 49 pounds at 45°, and finally 60 pounds

at 60° [7]. Therefore, when using gadgets with the necks sloped downwards, fatigue will rapidly be experienced as the burden on the neck rises.

5. Conclusion

The musculoskeletal impacts of the work from home program for the UI community due to gadget use worsens with increased frequency, and the effects are predominantly felt in the neck, shoulders, and the lower back. In addition, static posture, especially the bowed neck, hunched shoulders and back when using these devices must be considered. Moreover, the duration of this posture requires attention to prevent the accumulation of discomfort, and once a feeling of distress is experienced, a change of position is greatly advised. Finally, to minimize the musculoskeletal symptoms during WFH, it is a need for good approaches or guideline how to using gadget properly. Some of them are stretching, limiting usage time, and look away every 20 min at an object that is about 20 feet away for a full 20 s when using a gadget. In addition, adequate rest time is essential to reduce musculoskeletal complaints. The next study should be explored about the impact of psychosocial factors during WFH.

Declarations

Author contribution statement

Indri Hapsari Susilowati: Conceived and designed the experiments; Analyzed and interpreted the data; Wrote the paper.

L. Meily Kurniawidjaja: Conceived and designed the experiments.

Susiana Nugraha: Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Sjahrul Meizar Nasri: Conceived and designed the experiments; Contributed materials and analysis tools or data.

Ike Pujiriani: Performed the experiments; Contributed materials and analysis tools or data.

Bonardo Prayogo Hasiholan: Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

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Data availability statement

The data that has been used is confidential.

Declaration of interest's statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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