How to Cite:
Sitanggang, A. N., Susilowati, I. H., Hasiholan, B. P., Jyotidiwy, I. A. G., & Satria, N. (2022). Screen time and static posture of laptop usage among university student and staff during the COVID-19 pandemic . *International Journal of Health Sciences*, *6*(S2), 2069–2080. https://doi.org/10.53730/ijhs.v6nS2.5432

Screen time and static posture of laptop usage among university student and staff during the COVID-19 pandemic

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***Abstract*---**The government has been obliged to adapt educational activities through online learning in anticipation of the COVID-19 outbreak. Meanwhile the increase in the frequency and duration of laptop usage has implications for increased individual screen time. Therefore, this study aims to determine the description of screen time and the relationship between posture and the type of laptop usage. A total of 1085 people participated in the survey, including students, lecturers, and academic staff at the University of Indonesia. Data was collected through a questionnaire containing a list of questions related to the average laptop usage per day, which was divided into 4 categories, such as <1, 1-2, 2-3, and >3 hours. Another question is the purpose of using a laptop, which was divided into 11 types of activities and body postures. The results showed significant correlation in all observed body postures, sitting with a table was

International Journal of Health Sciences ISSN 2550-6978 E-ISSN 2550-696X © 2022.
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Manuscript submitted: 27 Jan 2022, Manuscript revised: 18 Feb 2022, Accepted for publication: 09 March 2022

significantly correlated with 7 types of activity, sitting without a table with 6 types of activity, sitting on the floor with a table with 4 types of activity, sitting on the floor without a table with 3 types of activity, standing with 4 types of activities and lying down with 3 types of activities. The massive laptop usage in various postures during online learning requires ergonomic

***Keywords*---**screen time, laptop usage, university student, COVID-19 pandemic.

Introduction

The COVID-19 pandemic in various parts of the world significantly impacted the population's physical and mental health status (Acter et al., 2020; Hossain et al., 2020), which include the health protocol that has been applied to various sectors, such as educational institutions in Indonesia(Djalante et al., 2020). This condition necessitates the adaptation of learning and teaching mechanism, one of which is the digital learning that has already implemented by the Indonesian government(Abidah et al., 2020). Furthermore, this and several other similar terms are defined as learning activities conducted using a computer connected to the internet network, which can be performed anywhere, anytime, and with various methods(Cojocariu et al., 2014). The application of this learning method is inextricably linked to digital devices, including a laptop. Several previous studies revealed that laptops usage is an activity that cannot be avoided in the world of lectures (Bowman et al., 2014). Although it is not designed for long-term usage, it is in demand and utilized as the main computer because of its flexibility(Chavda et al., 2013). Its massive use in the world of lectures contributes to the increase in screen time of individuals. Furthermore, screen time does not only include the use of devices for work purposes (doing assignments, studying) but also use for entertainment or recreation (watching videos and social media) (Pandya & Lodha, 2021). A study in the UK states that the average total screen time in the productive age group (under 34 years) tends to be higher than 65 years and over. This also discovered a positive association between screen time and mental health status (Smith et al., 2020). According to other studies, overall screen time among students does not lead to health problems such as pain complaints(Benden et al., 2021). Therefore, during the COVID-19 pandemic, it is necessary to investigate the usage of laptops during online learning from an ergonomic perspective related to increased screen time and its relationship to posture, particularly for students and university employees (lecturers and administrative staff).

Method

The study was conducted based on data obtained from the results of questionnaires filled out by students and employees, including lecturers and administrative staff of the University of Indonesia. The questionnaire contained a list of questions related to posture while using a laptop in distance learning activities. Furthermore, the univariate and bivariate data were then analyzed by the chi-square method with a 95% confidence level to determine the relationship between the two variables and their significance using the p-value. After being

declared to have passed the ethical review with the number: 109/UN2.F10.D11/PPM.00.02/2020 from The Research and Community Engagement Ethical Committee of the Faculty of Public Health, University of Indonesia, the analysis was conducted using SPSS software.

The respondents are teaching staff, research center staff, academic staff, and active students currently experiencing diploma, bachelor, master, doctoral, and professional education. The minimum sample formulation was determined based on Slovin's Formula with a 99% CI by considering the total population of 44,189 people in the 2019/2020 school year. Furthermore, the calculation results of the minimum and overall sample were 396 and 1085 respondents, respectively. Therefore, the sample obtained has exceeded the minimum required amount. Data was collected using a questionnaire tested using the item validity method on 110 respondents. As a result, Rtable df 108 (df = N-2) was obtained, all questions were declared valid because the Rcount obtained is greater than Rtable (0.108). The Cronbach's Alpha instrument of 0.798 shows the questionnaire's reliability. Therefore, there is a 95% confidence that the questionnaire employed is reliable because it is greater than Rtable 0.189.

Result and Discussion

The table showed that most respondents are women with a proportion of 65.90% and the majority are in the age range of 21-30 years at 35.21%, followed by ages under 20 years at 31.34%. Of the total, 65.35% are students and the highest proportion (46.05) of those using a laptop is between 6 to 10 years.

Table 1 Sociodemography of respondents

	Frequency	**Percentage (%)**
Gender		
Male	370	34.10
Female	715	65.90
Age		
≤ 20 Years old	340	31.34
21-30 Years old	382	35.21
31-40 Years old	171	15.76
41-50 Years old	119	10.97
51-60 Years old	54	4.98
>61 Years old	19	1.75
Job Category		
Student	709	65.35
Lecturer	118	10.88
Staff Administration	258	23.78
Usage Period		
≤ 5 Years	167	16.09
6-10 Years	478	46.05

>10 Years	393	37.86

Considering the 10 types of activities related to laptop usage, the majorities which are performed in less than 1 hour per day were sending and receiving emails (66.3%), arranging activity schedules (73.8%), playing games on social networks (64.4%), and calling, watching or listening (34.7%). Meanwhile, the majority of activities performed in more than 3 hours were typing (31.9%), video meetings (29.0%), making assignment documents (41.7%), and lectures (52.8%).

Table 2 Screentime of Laptop Usage

Activity	< 1 hour		1-2 hours		2-3 hours		> 3 hours	
	f	%	f	%	f	%	F	%
Reading	237	24,8	362	37,8	172	18,0	186	19,4
Typing	107	10,7	309	31,0	264	26,5	318	31,9
Sending and Receiving Email	639	66,3	224	23,2	52	5,4	49	5,1
Browsing the Web	190	19,4	312	31,9	236	24,2	239	24,5
Video Meeting	122	13,2	256	27,7	279	30,2	268	29,0
Setting the Activity Schedule	461	73,8	121	19,4	25	4,0	18	2,9
Creating Assignment Documents	93	9,4	248	25,0	237	23,9	414	41,7
Lectures	68	6,9	166	16,8	232	23,5	521	52,8
Play Social Network	413	64,4	147	22,9	38	5,9	43	6,7
Calling, Watching, Listening to Something	277	34,7	235	29,4	133	16,6	154	19,3
Playing games	105	56,5	46	24,7	35	18,8	0	0

The respondent's body posture in using a laptop included sitting, standing, and lying postures. Therefore, to determine the relationship between the purpose of laptop usage (independent variable) and body posture (dependent variable), bivariate analysis was conducted through the chi-square test with a 95% confidence level.

The result of the table with sitting posture test showed p-values below 0.05 in 7 types of activities, namely sending and receiving emails (0.013), surfing the web (0.016), video meetings (0.003), arranging activity schedules (0.008), making assignment documents (0.001), playing social networks (0.012) and calling, watching or listening to something (0.004). Therefore, it implies that a significant correlation exist between sitting posture and the table with the 7 types of activity.

Table 3 Bivariate analysis of seat sitting posture

Laptop	Sitting on the chair				Total		P-value	95% CI
	No		Yes					
	N	%	n	%	n	%		
Activities performed								
Reading								
No	6	11,8	45	88,2	51	100		1,442

Yes	81	8,5	876	91,5	957	100	0,435	(0,597-3,482)
Typing								
No	1	10,0	9	90,0	10	100		1,178
Yes	86	8,6	912	91,4	998	100	1	(0,148-9,411)
Emailing								
No	9	20,5	35	79,5	44	100		2,921
Yes	78	8,1	886	91,9	964	100	0,013*	(1,355-6,297)
Browsing the Web								
No	7	22,6	24	77,4	31	100		3,27
Yes	80	8,2	897	91,8	977	100	0,016*	(1,367-7,825)
Video Meeting								
No	15	18,1	68	81,9	83	100		2,613
Yes	72	7,8	853	92,2	925	100	0,003*	(1,422-4,803)
Setting the Activity Schedule								
No	45	11,7	338	88,3	383	100		1,848
Yes	42	6,7	583	93,3	625	100	0,008*	(1,189-2,873)
Creating Assignment Documents								
No	6	37,5	10	62,5	16	100		6,748
Yes	81	8,2	911	91,8	992	100	0,001*	(2,392-19,041)
Lectures/work								
No	3	14,3	18	85,7	21	100		1,792
Yes	84	8,5	903	91,5	987	100	0,389	(0,517-6,207)
Play Social Network								
No	43	11,7	324	88,3	367	100		1,8
Yes	44	6,9	597	93,1	641	100	0,012*	(1,158-2,8)
Calling, Watching, Listening to Something								
No	29	13,9	180	86,1	209	100		2,058
Yes	58	7,3	741	92,7	799	100	0,004*	(1,281-3,3)
Playing games								
No	70	8,5	752	91,5	822	100		0,925
Yes	17	9,1	169	90,9	186	100	0,786	(0,531-1,613)

The result for the sitting posture on the floor with a table showed p-values below 0.05 in 4 types of activities, namely sending and receiving emails (0.026), browsing the web (0.003), video meetings (0.041), and playing social networks (0.048). Therefore, it implies that a significant correlation exist between sitting posture on the floor with a table and the 4 types of activity.

Table 4 Bivariate analysis of sitting posture on the floor

Laptop	Sitting on the floor				Total		P-value	95% CI
	No		Yes					
	N	%	n	%	n	%		
Activities performed								
Reading								
No	19	37,3	32	62,7	51	100		1,458
Yes	277	28,9	680	71,1	957	100	0,266	(0,812-2,615)
Typing								
No	4	40,0	6	60,0	10	100		1,612
Yes	292	29,3	706	70,7	998	100	0,471	(0,452-5,754)
Emailing								
No	20	45,5	24	54,5	44	100		2,077
Yes	276	28,6	688	71,4	964	100	0,026	(1,129-3,822)
Browsing the Web								
No	17	54,8	14	45,2	31	100		3,038
Yes	279	28,6	698	71,4	977	100	0,003	(1,477-6,246)
Video Meeting								
No	33	39,8	50	60,2	83	100		1,661
Yes	263	28,4	662	71,6	925	100	0,041	(1,046-2,637)
Setting the Activity Schedule								
No	121	31,6	262	68,4	383	100		1,188
Yes	175	28,0	450	72,0	625	100	0,252	(0,9-1,567)
Creating Assignment Documents								
No	7	43,8	9	56,3	16	100		1,892
Yes	289	29,1	703	70,9	992	100	0,219	(0,698-5,128)
Lectures/work								
No	9	42,9	12	57,1	21	100		1,829
Yes	287	29,1	700	70,9	987	100	0,259	(0,762-4,389)
Play Social Network								
No	122	33,2	245	66,8	367	100		1,336
Yes	174	27,1	467	72,9	641	100	0,048	(1,012-1,765)
Calling, Watching, Listening to Something								
No	73	34,9	136	65,1	209	100		1,386
Yes	223	27,9	576	72,1	799	100	0,058	(1,003-1,916)
Playing games								

No	251	30,5	571	69,5	822	100		1,377
Yes	45	24,2	141	75,8	186	100	0,104	(0,954-1,988)

The test result on the standing posture with a table while using a laptop showed p-values below 0.05 for 4 types of activity, namely arranging activity schedules, playing social networks, and calling, watching or listening to something, as well as playing games with a total p-value of 0.0001. Therefore, it implies that a significant correlation exist between standing and desk postures with these 4 types of activities.

Table 5 Bivariate analysis of standing posture

Laptop	**Stand up**				**Total**		**P-value**	**95% CI**
	No		**Yes**					
	N	**%**	**n**	**%**	**n**	**%**		
Activities performed								
Reading								
No	47	92,2	4	7,8	51	100		1,573
Yes	844	88,2	113	11,8	957	100	0,524	(0,556-4,449)
Typing								
No	7	70,0	3	30,0	10	100		0,301
Yes	884	88,6	114	11,4	998	100	0,116	(0,077-1,18)
Emailing								
No	39	88,6	5	11,4	44	100		1,025
Yes	852	88,4	112	11,6	964	100	1	(0,396-2,656)
Browsing the Web								
No	27	87,1	4	12,9	31	100		0,883
Yes	864	88,4	113	11,6	977	100	0,822	(0,303-2,569)
Video Meeting								
No	74	89,2	9	10,8	83	100		1,087
Yes	817	88,3	108	11,7	925	100	0,962	(0,529-2,234)
Setting the Activity Schedule								
No	359	93,7	24	6,3	383	100		2,615
Yes	532	85,1	93	14,9	625	100	0,001*	(1,637-4,177)
Creating Assignment Documents								
No	13	81,3	3	18,8	16	100		0,563
Yes	878	88,5	114	11,5	992	100	0,403	(0,158-2,004)
Lectures/work								
No	87	85,7	3	14,3	21	100		0,784

Yes	873	88,4	114	11,6	987	100	0,707	(0,227-2,701)
Play Social Network								
No	344	93,7	23	6,3	367	100		2,57
Yes	547	85,3	94	14,7	641	100	0,001*	(1,598-4,135)
Calling, Watching, Listening to Something								
No	201	96,2	8	3,8	209	100		3,969
Yes	690	86,4	109	13,6	799	100	0,001*	(1,903-8,277)
Playing games								
No	743	90,4	79	9,6	822	100		2,415
Yes	148	79,6	38	20,4	186	100	0,001*	(1,578-3,695)

It was observed that the lying posture was in the prone position with a p-value below 0.05 in 5 types of activity, namely browsing the web (0.0001), video meeting (0.001), lectures (0.026), playing social networks (0.0001), and calling, watching, or listening to something (0.0001). Therefore, this implies a significant correlation between lying face down posture and these 5 types of activity.

Table 6 Bivariate analysis of lying posture

Laptop	**Lying face down**				**Total**		**P-value**	**95% CI**
	No		**Ya**					
	N	**%**	**n**	**%**	**n**	**%**		
Activities performed								
Reading								
No	26	51,0	25	49,0	51	100		1,28
Yes	429	44,8	528	55,2	957	100	0,474	(0,729-2,249)
Typing								
No	6	60,0	4	40,0	10	100		1,834
Yes	449	45,0	549	55,0	998	100	0,344	(0,514-6,539)
Emailing								
No	25	56,8	19	43,2	44	100		1,634
Yes	430	44,6	534	55,4	964	100	0,151	(0,88-3,007)
Browsing the Web								
No	24	77,4	7	22,6	31	100		4,343
Yes	431	44,1	546	55,9	977	100	0,0001*	(1,854-10,17)
Video Meeting								
No	52	62,7	31	37,3	83	100		2,173
Yes	403	43,6	522	56,4	925	100	0,001*	(1,367-3,453)

Setting the Activity Schedule								
No	171	44,6	212	55,4	383	100		0,968
Yes	284	45,4	341	54,6	625	100	0,857	(0,75-1,25)
Creating Assignment Documents								
No	11	68,8	5	31,3	16	100		2,715
Yes	444	44,8	548	55,2	992	100	0,097	(0,937-7,873)
Lectures/work								
No	15	71,4	6	28,6	21	100		3,108
Yes	440	44,6	547	55,4	987	100	0,026*	(1,196-8,077)
Play Social Network								
No	197	53,7	170	46,3	367	100		1,72
Yes	258	40,2	383	59,8	641	100	0,0001*	(1,328-2,229)
Calling, Watching, Listening to Something								
No	132	63,2	77	36,8	209	100		2,526
Yes	323	40,4	476	59,6	799	100	0,0001*	(1,844-3,460)
Playing games								
No	382	46,5	440	53,5	822	100		1,344
Yes	73	39,2	113	60,8	186	100	0,088	(0,971-1,859)

The results show a significant relationship between laptop usage activities and standing posture with a table. Furthermore, the activities with a significant correlation are performed in a short time of less than 1 hour. This activity preference is related to studies stating that employees experience complaints about discomfort in a standing position for long periods at work(Gallagher et al., 2014). Another study also stated that standing for long periods (up to 2 hours or more), which increases discomfort in various body areas, also reduces cognitive abilities (Baker et al., 2018). However, it appears that alternating this posture with light walking has a positive impact on increasing insulin sensitivity, lipid circulation, and blood pressure in obese people compared to a sitting posture(Duvivier et al., 2017). This implies that the posture provides positive benefits when performed for a not too long period and combined with other postures such as sitting posture to reduce sedentary behavior. In addition, the combination of sitting and standing reduces lumbar flexion and wrist extension to prevent musculoskeletal complaints and injuries (Chambers et al., 2019).

Other laptop-related activities were also significantly correlated to sitting posture. While utilizing a laptop, there was considerably more head-neck (HN) and head-neck-trunk (HNT) flexion on bilateral elbow flexion, as well as shoulder elevation. Furthermore, laptop usage under sitting conditions increases exposure to postures, leading to musculoskeletal disorders (Jia & Nussbaum, 2018). Besides

having a negative effect on physical health, it affects non-physical (mental) health due to a high workload and a stressful schedule that requires continuous sitting. Also, psychosocial stress contributes to the risk of developing work-related musculoskeletal disorders. Risk factors for postural discomfort include posture, duration, and type of activity. The ideal posture adopted during laptop use is sitting in a chair with the laptop on a table for less than 4 hours (Osama & Javed Malik, 2018).
A significant relationship was also discovered between sitting posture on the floor and chair. Another study stated that sitting on the floor in a cross-legged position was associated with improved blood circulation (Oyama & Mitsuya, n.d.). In addition, other studies showed that this position increases hip mobility and even reduces the risk of developing knee osteoarthritis(Dahaghin et al., 2009). However, despite its potential benefits, working long hours sitting on the floor has been associated with increased hip and lower back pain(Thongsuk & Geater, 2021). Another study showed that people with lower back surgery are not adviced to sit on the floor (Shim & Lee, 2019)since spending too much time in this position causes lumbar kyphosis.

The results also showed a significant correlation between using a laptop and lying face down. Duration of 1-2 hours was required to browse the internet. On the other hand, lecture activities and video meetings require more than 3 hours. The prone position is a non-neutral working position, specifically for the shoulders, elbows, wrists, and neck, despite the short length of activity (Gold et al., 2012). This results in scapula retraction and elevation (shoulder shrugging) with increased levels of muscle activity in the thoracic erector spinae and rhomboids (Schüldt & Harms-Ringdahl, 1988). In addition, the neck extension posture places the active muscles in a less optimal length to produce muscle strength, causing premature fatigue.

Conclusion

The application of online learning methods during the COVID-19 pandemic has resulted in students, teaching staff, and academic staff spending much time in front of laptops. Unfortunately, due to laptop usage, various variations in body posture put users at risk for health problems. Therefore, a significant correlation between the type of activity while using a laptop and body posture shows the need for awareness and intervention related to ergonomics, specifically while using a laptop, to minimize the health risks caused.

Acknowledgments

This work is supported by grants “Penelitian Dasar Unggulan Perguruan Tinggi”, funded by the Ministry of Research and Technology, with number NKB-151/UN2.RST/HKP.05.00/2021.

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