



Original Article

Fatigue and pain related to internet usage among university students

KIM SANG DOL¹⁾

¹⁾ Department of Nursing, College of Health Science, Kangwon National University: 346 Hwangjo-gil, Dogye-eup, Samcheok-si, Gangwon-do 245-907, Republic of Korea

Abstract. [Purpose] This study was performed to assess fatigue and pain levels related to internet usage among university students. The dominant regions of fatigue and pain in the body were examined, as well as differences in fatigue and pain levels among students. [Subjects and Methods] The study used a descriptive survey and a convenience sample of 378 students from a single university. The data were collected from January 1 to June 31, 2015. Fatigue and pain levels were measured using a visual analog scale. [Results] The average reported by the participants 4.7 and 3.7 levels of fatigue and pain, respectively. The regions with the highest fatigue scores were the eyes, followed by the neck, and shoulders. The regions with the highest pain scores were the neck, followed by the shoulders, and the waist. The results show that participants' fatigue and pain levels depended on the duration of their internet use per day. [Conclusion] These findings indicate that control of internet usage time is needed to maintain the well-being of university students who use the internet.

Key words: Internet usage, Fatigue, Pain

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INTRODUCTION

The prevalence of internet usage has increased worldwide. In 2013, almost 39% of the world's population and 95% of college and university students were estimated to be using the internet¹⁾. The time spent on the internet averages 734 minutes a day in America, 342 minutes a day in Japan, and 379 minutes a day in Korea^{2, 3)}. College and university students spend approximately 16.7 hours a week on the internet⁴⁾. The reasons cited for internet usage are interpersonal and social networking, education, business, shopping, reading the news, and various books, watching TV or films, and numerous other functions and activities^{4, 5)}. Although the internet provides a variety of benefits, young users can also suffer from problems related to internet usage^{4, 6)}. Previous studies involving US, Japanese, and Chinese university students suggest that a variety of issues, such as an inability to control time spent on the internet, addiction, anxiety, depression, negative self-image, and poor interpersonal relations can occur with prolonged internet use^{4, 6, 7)}. A variety of physical problems are also associated with frequent internet use, including carpal tunnel syndrome, dry eyes, headaches, and altered sleep patterns^{8, 9)}. Moreover, frequent internet users have been shown to have poor academic performance⁹⁾. Other studies have reported that internet usage causes physical problems, resulting in musculoskeletal complaints and pain or visual fatigue^{10–14)}. Although college or university students have high levels of internet usage in their studies or personal lives, the internet can have a negative influence on students' health. There are very few studies on physical problems related to internet usage that have specifically focused on university students. Furthermore, to date, no clear relation has been established between internet usage via computers, smart-phones, and tablets, and physical fatigue and pain experienced by university students. Therefore, early detection efforts need to be made to identify physical fatigue and pain that may lead to long-term health problems. In addition, interventions should be developed to help address potential health risks associated with internet usage, as these may significantly improve health outcomes for internet users. The purpose of this study was to investigate fatigue and pain levels related to internet usage among university students, to identify the regions of the body where fatigue and pain were most commonly experienced, and

Corresponding author. Kim Sang Dol (E-mail: nu11110@kangwon.ac.kr)

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to measure differences in fatigue and pain levels, and general characteristics among the participants.

SUBJECTS AND METHODS

A survey was administered to 378 university students. The participants were recruited using a social networking site (SNS). The participants were all volunteer undergraduate nursing and occupational therapy students. All participants received detailed information on the purpose and usefulness of this study and were provided with a written consent form. The Institutional Review Board of Kangwon National University approved this study. After the participants had signed the informed consent form, they responded to 23 items of a questionnaire. Fatigue and pain levels were assessed subjectively using 100-mm fatigue and pain visual analog scales (VAS). Participants marked their perceived levels of fatigue and pain on a 0 to 100-mm horizontal line. The survey questionnaire consisted of 7 items on general characteristics, 1 item on overall physical fatigue, 1 item on overall physical pain, 1 item on highest physical fatigue location, 1 item on highest physical pain location, 6 items on physical fatigue levels of regions of the body, and 6 items on physical pain levels of regions of the body.

Statistical analyses were conducted using SPSS (version 18.0) for Windows. All data are presented as the mean±SD. Significant differences based on demographic characteristics and subjects variables were established using t tests or ANOVA. Findings were considered statistically significant if they had a probability value of less than 0.05.

RESULTS

A total of 378 eligible respondents completed the survey (a 95% response rate). The demographic data of our participants and study findings are summarized in Table 1. Participants' fatigue and pain values are presented in Table 2. The average levels of fatigue and pain reported by the participants were 4.7 and 3.7, respectively. The regions with the highest fatigue scores were the eyes, followed by the neck, and the shoulders ($p < 0.05$). The regions with the highest pain scores were the neck, followed by the shoulders, and the waist ($p < 0.05$). Fatigue levels were significantly higher among female students than among male students ($p < 0.05$). There were significant differences in the fatigue and pain levels of the participants according to the time spent using the internet per day, respectively ($p < 0.001$, $p < 0.01$).

DISCUSSION

Our results indicated that the fatigue and pain levels experienced by university students who use the internet were moderate. Our participants' fatigue levels were similar to those obtained in a study that was conducted of private bank employees¹⁴. The pain levels of our participants were also similar to those found in a study that examined computer workers¹⁰. In a previous study, which did not include university students, a significant negative correlation was also found between the pain intensity and physical activity of computer users¹⁰. This implies that a proper physical exercise program is needed to maintain the health of university students who use the internet.

Fatigue levels were significantly higher among female students than among male students. As in previous research, our findings support the idea that female university students are as likely to have problems associated with internet usage as men, due to the recent increase in female social network usage⁴. However, there are few studies related to fatigue and pain related to internet usage of university students. Therefore, our results indicate that further research is needed targeting university students.

The dominant regions of fatigue were the eyes, neck, and shoulders. Visual fatigue was the most frequent complaint among video monitor users¹³. These findings support the idea that computer tasks impose high visual and motor demands on users, and that frequent usage seems to cause eye fatigue¹². Generally, a user's eye is on target before the hand and the user moves the cursor to where the eye is looking¹². A previous study reported that the cause of visual fatigue could be poor habits of internet users¹⁴. Furthermore, these findings are similar to those obtained in studies on prolonged internet use via computer or mobile phone: When internet users experience fatigue, there are often musculoskeletal symptoms as well¹². This implies that it is necessary to regularly, or at least occasionally, take a break during internet usage to maintain the eye health of internet users^{15, 16}.

The dominant regions of pain were the neck, shoulders, and waist. These findings are similar to those reported by previous research that computer workers commonly complain of pain in the neck and shoulder region as well as in the other upper extremities¹⁷. Contrary to the findings of this study, a previous study suggested that the hand and forearm regions were more susceptible to physical pain resulting from computer usage than the neck and shoulder regions¹⁰. These results imply that further research is needed to identify reliable data for the physical pain locations related to internet usage in university students.

The results show that the participants' fatigue and pain levels depended on the duration of their internet use per day. Self-reported fatigue increased with amount of internet use, with the greatest observed increase occurring in the eyes^{12, 13}. Contrary to our study, a previous study did not find any significant differences between the reported numbers of hours spent using the internet and pain intensity of the dominant regions¹⁰. It is clear from research that many college or university students have concerns about internet usage in their daily lives^{18, 19}. A previous study that suggested that up to 98% of

Table 1. General characteristics of the subjects

Characteristics		N (%)
Department	Nursing	248 (65.4)
	Occupational therapy	131 (34.6)
Gender	Male	81 (21.4)
	Female	298 (78.6)
Grade	Freshmen	109 (28.8)
	Sophomore	80 (22.2)
	Junior	97 (25.6)
	Senior	89 (23.5)
Age (years)	<20	22 (5.8)
	20 \geq -<25	327 (86.9)
	25 \geq -<30	29 (7.7)
	30 \geq	1 (0.3)
Body weight	Obesity	28 (7.4)
	Overweight	66 (17.4)
	Normal weight	270 (71.2)
	Underweight	15 (4.0)
Time spent using the internet per day (hours)	1<	71 (18.7)
	1-<2	76 (20.1)
	2 \geq -<3	140 (26.4)
	3 \geq -<4	71 (10.7)
	4 \geq	61 (16.1)
Internet media	Cellular phone	320 (84.4)
	Computer	20 (5.3)
	Tablet	39 (10.3)
Regions of dominant fatigue	Fingers	15 (4.0)
	Wrists	22 (5.8)
	Shoulders	59 (15.8)
	Neck	87 (23.0)
	Waist	28 (7.4)
	Legs	4 (1.1)
	Eyes	164 (43.3)
Regions of dominant pain	Fingers	24 (6.3)
	Wrists	45 (11.9)
	Shoulders	80 (21.1)
	Neck	119 (31.4)
	Waist	40 (10.6)
	Legs	4 (1.1)
	Eyes	67 (17.7)

SD: standard deviation

college students have an SNS profile and that most report daily use⁷). Another study suggested that students who reported problematic internet use also reported a lack of physical activity⁴). The data indicate that as internet use increases, the level of exercise decreases⁴). Moreover, that same study also suggested that higher levels of internet use may be related to unhealthy lifestyles⁴). A previous study found that it was unclear whether the lack of physical activity was a result of internet use, but that increasing physical activity may help students reduce their internet usage⁴). Higher internet use is associated with reduced physical activity⁴). Physical activity has also been shown to help reduce pain intensity^{15, 20}). Recently, a relationship between high intensity physical activity and lower neck pain was reported, suggesting the possible role of physical activity in preventing musculoskeletal pain²⁰). Therefore, our present research supports the idea that physical activity can serve as a means of coping with many addictive or compulsive behaviors^{21, 22}).

This study had several limitations. First, there was a lack of generalizability due to the usage of a convenience sample of students from the same university. The present study also relied on participants' self-reported levels of subjective fatigue and

Table 2. Differences in physical fatigue and pain levels related to internet use

Variables		Mean \pm SD	
		Pain	Fatigue
Department	Nursing	3.6 \pm 2.2	4.7 \pm 2.0
	Occupational therapy	4.0 \pm 1.9	4.8 \pm 1.8
Gender	Male	3.4 \pm 2.2	4.2 \pm 2.1**
	Female	3.8 \pm 2.1	4.9 \pm 1.9
Grade	Freshmen	3.7 \pm 3.0	4.7 \pm 1.7
	Sophomore	3.8 \pm 2.2	4.7 \pm 2.1
	Junior	3.7 \pm 2.3	4.7 \pm 1.9
	Senior	3.8 \pm 2.0	4.8 \pm 1.9
Age (years)	<20	3.8 \pm 1.7	5.2 \pm 0.9
	20 \geq -<25	3.7 \pm 2.1	4.7 \pm 2.0
	25 \geq -<30	3.7 \pm 2.2	4.5 \pm 2.3
	30 \geq	5.0 \pm 1.0	4.0 \pm 1.0
Body weight	Obesity	4.3 \pm 2.0	4.7 \pm 1.9
	Overweight	3.3 \pm 2.2	4.4 \pm 2.1
	Normal weight	3.8 \pm 2.1	4.8 \pm 1.9
	Underweight	3.5 \pm 2.4	4.4 \pm 1.9
Time spent using the internet per day (hours)	1<	3.4 \pm 2.1**	4.3 \pm 2.0***
	1-<2	3.1 \pm 2.0	4.1 \pm 2.0
	2 \geq -<3	3.9 \pm 1.9	4.8 \pm 1.9
	3 \geq -<4	4.1 \pm 2.0	5.2 \pm 1.8
	4 \geq	4.3 \pm 2.4	5.4 \pm 1.8
Internet media	Cellular phone	3.7 \pm 2.0	4.8 \pm 1.9
	Computer	4.4 \pm 2.6	4.7 \pm 2.2
	Tablet	3.5 \pm 2.3	4.5 \pm 2.0
Regions of body	Fingers	2.1 \pm 2.1*	2.1 \pm 2.2*
	Wrists	2.6 \pm 2.3	2.5 \pm 2.2
	Shoulders	4.0 \pm 2.5	3.9 \pm 2.6
	Neck	4.5 \pm 2.5	4.1 \pm 2.6
	Waist	3.2 \pm 2.6	3.0 \pm 2.5
	Legs	1.5 \pm 2.0	1.5 \pm 2.0
	Eyes	4.4 \pm 2.5	5.0 \pm 2.7
	Overall	3.7 \pm 2.1	4.7 \pm 1.9

*p<0.05; **p<0.01; ***p<0.001; SD: standard deviation

pain. Despite these limitations, the results of this study have some important implications for university students who use the internet, as well as university administrators. In the future, internet use will continue to increase among university students. Therefore, students may need to make it a habit to perform eye protection measures during internet use, including taking regular breaks, and performing eye yoga and exercise. Moreover, physical exercise may promote musculoskeletal health among university students who use the internet.

In conclusion, our findings indicate that university students who use the internet experience the most fatigue and pain in the eyes, neck, and shoulders. Hence, university students should engage in regular physical activity and take other preventive measures when using the internet. Furthermore, future multidimensional research needs to be conducted, and more tools for preventing health problems related to internet use need to be developed for university students.

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