

原著

## Learning environment: Effects of Internet-use and learning activities among college students aiming to become medical specialists

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**Abstract :** Internet use is rapidly increasing and excessive time on the Internet can lead to interpersonal or physical problems. Focusing on students in the Faculty of Health Sciences, this study aimed to survey student use of the Internet, and detect degree of influence of the learning environment. The study demonstrates that time spent on the Internet is longer for females than males. Respondents with high Internet use (over 5 hours a day) comprised 29% of the total sample and demonstrated limited time for learning and sleeping, and increased time for part-time working. Students who use the Internet less were more likely to select 'study' as a priority of college life, and considered their current course of study congruent with their plans. This study suggests that students with high Internet use may lose their sense of purpose to become medical specialists. Establishing a firm sense of purpose for one's future could be an essential factor to foster learning motivation, leading to increased levels of independent study and greater awareness of the learning environment.

**Keyword :** *Internet, learning environment, learning motivation, health sciences*

### 1. Introduction

Since the 1990s, Internet use has rapidly increased and time spent on the Internet has now become an important research topic<sup>1)</sup>. Young people are becoming more and more attached to the Internet as a means of communicating, learning and seeking any information they want, even although they often consider online practices demanding and even unnecessary. It seems as if young people use the Internet as a key means of keeping themselves up to date, entertained and in touch with their social lives. Along with the growing phenomenon of vast browsing of the Internet, many studies are trying to identify the impacts of heavy Internet usage, specifically for young people. It has been reported that 30% of Internet users are browsing the Internet without any specific reason; 67% of them are male, and that young adults act much like teens in their tendency to use social networking sites, with 72% of them engaged in social media both during the day and at night<sup>2)</sup>. In Japan, young people's average Internet use has increased rapidly in recent years, reaching an average of 3.62 h online each day in 2018<sup>3)</sup> and 3.7 h in 2019<sup>4)</sup>, half of which is spent on mobile devices. The survey by the Health, Labor and Welfare Ministry reported that 10.6% of junior high

school boys and 14.3% of junior high school girls were using the Internet obsessively<sup>4)</sup>. Among high school students, 13.2% of boys and 18.9% of girls were also considered heavy Internet users. For teenagers, the prevalence of smartphone games and social networking services might be partly to blame for the surge. In addition, even in academic performance, students seem especially vulnerable, with case studies highlighting that students are required to spend more and more time online for their studies<sup>5)</sup>. Heavy Internet users suffer health consequences from loss of sleep as they stay up later and later to chat online, check for social network status updates or to reach the next game levels<sup>2)</sup>.

Excessive Internet use can lead to many problems – interpersonal, behavioral, physical, psychological, and work problems – in daily life. However, there are few studies that have investigated Internet use of college students in health sciences courses. Therefore, this study focused on the Internet use of students studying to be medical specialists. The study aimed to survey actual Internet use and detect the degree of influence of learning environment on students in the Faculty of Health Sciences.

## 2. Methods

### 2.1 Participants

The questionnaire survey was conducted among Department of Medical Engineering students studying in the Faculty of Health Sciences from 2017 to 2019. Respondents were limited to students in their first year or first-time respondents in second or third year of university. Questionnaire responses were collected after informed consent was obtained from the respondents and partially completed questionnaires were excluded. The final number of respondents was 295 students (168 male, 127 female). This study was approved by the Junshin Gakuen University Ethics Committee (file number 29-09) in accordance with the Declaration of Helsinki.

### 2.2 Questionnaire

The questionnaire was designed to assess factors in the learning environment that may be influenced by Internet use. The question areas for *learning environment* were as follows: learning time, Internet-using time, part-time job time, and sleeping time. *Physical condition* included questions to evaluate students' health state. In consideration of internal factors, questions regarding *priority for college life* and *course congruence* were asked.

In the items of *learning environment*, 'learning time' refers to independent learning time excluding lecture time at the university. The length of learning time was calculated as average time on weekdays, irrespective of the context of study (e.g., preparing for a lecture, writing a report, autonomous study). 'Internet-using time' refers to time spent on Internet activities online or through mobile devices each day. Working hours for 'part-time job' refers to total hours engaged in part-time work each week. 'Sleeping time' refers to average duration of sleep. *Physical condition* refers to the health state of students with potential answers selected from 'good condition' or 'poor condition' and multiple choice options including 'less sleep', 'headache', 'listless', 'anorexia', 'fatigue', and 'irritation'. *Priority for college life* refers to aspects that students consider most important in their current college life. Possible

answers included: 'study', 'hobby or leisure', 'acquaintance with friends', 'part-time job', 'acquisition of personal qualification', 'nothing', and 'others'. *Course congruence* refers to the match between desired plans before enrolment and current path/actual course.

### 2.3 Statistical analysis

Statistical significance was assessed using the Chi-squared test, Welch's t test, and Pearson's correlation coefficient. A  $p$  value of  $< 0.05$  was considered statistically significant. Statistical analyses were performed with SPSS software (version 19.0; SPSS, Tokyo, Japan).

## 3. Results

### 3-1. Questionnaire items

The results of the questionnaire are shown in Table 1. For duration of learning time, Internet-using time, and part-time job, females showed greater durations than males. The difference between females and males for Internet-using time was significant ( $p < 0.05$ ).

With regard to *physical condition*, respondents in good health accounted for approximately one quarter of the total sample. Respondents in poor condition most commonly reported symptoms of 'fatigue', following by 'listless', 'less sleep', 'irritation', 'headache', and 'anorexia'. These symptoms predominated in females, and significant gender differences were seen for options of 'headache', 'listless', and 'fatigue' ( $p < 0.01$ ,  $p < 0.05$ , and  $p < 0.05$ , respectively).

With regard to *priority for college life*, the majority (54.6%) responded with 'study', followed by 'hobby or leisure' (21.7%) and 'acquaintance with friends' (14.2%). Significant gender differences were seen in 'acquaintance with friends' (male  $>$  female,  $p < 0.05$ ), and 'nothing' (male  $<$  female,  $p < 0.05$ ).

With regard to *course congruence*, approximately half of the respondents answered 'Yes', i.e. they felt their current course matched with their original plans, and no gender differences were noted.

Table 1. Results of the questionnaire

|                                       | Average $\pm$ SD | Male            | Female          | <i>p</i> value |
|---------------------------------------|------------------|-----------------|-----------------|----------------|
| <b>Numbers of responders (%)</b>      | 295              | 168 ( 56.9 %)   | 127 ( 43.1 %)   |                |
| <b>Learning environment</b>           |                  |                 |                 |                |
| learning time [h/day]                 | 0.8 $\pm$ 1.09   | 0.77 $\pm$ 0.99 | 0.85 $\pm$ 1.2  | ns             |
| Internet-using time [h/day]           | 3.62 $\pm$ 2.73  | 3.29 $\pm$ 2.5  | 4.06 $\pm$ 2.95 | < 0.05         |
| part-time job [h/day]                 | 10.64 $\pm$ 10.6 | 9.8 $\pm$ 11.2  | 11.98 $\pm$ 9.8 | ns             |
| sleeping time [h/day]                 | 6.05 $\pm$ 2.49  | 6.02 $\pm$ 1.17 | 5.67 $\pm$ 1.14 | ns             |
| <b>Physical condition</b>             |                  |                 |                 |                |
| Good condition                        | 225 ( 76.3 %)    | 133 ( 79.2 %)   | 92 ( 72.4 %)    | ns             |
| Poor condition                        |                  |                 |                 |                |
| less sleep                            | 31 ( 10.5 %)     | 15 ( 10.5 %)    | 16 ( 12.6 %)    | ns             |
| headache                              | 18 ( 6.1 %)      | 5 ( 6.1 %)      | 13 ( 10.2 %)    | < 0.01         |
| spiritless                            | 46 ( 15.6 %)     | 19 ( 15.6 %)    | 27 ( 21.3 %)    | < 0.05         |
| anorexia                              | 14 ( 4.7 %)      | 5 ( 4.7 %)      | 9 ( 7.1 %)      | ns             |
| fatigue                               | 48 ( 16.3 %)     | 20 ( 16.3 %)    | 28 ( 22 %)      | < 0.05         |
| irritation                            | 20 ( 6.8 %)      | 8 ( 6.8 %)      | 12 ( 9.4 %)     | ns             |
| <b>Priority for college life</b>      |                  |                 |                 |                |
| study                                 | 161 ( 54.6 %)    | 94 ( 56 %)      | 67 ( 52.8 %)    | ns             |
| hobby or leisure                      | 64 ( 21.7 %)     | 32 ( 19 %)      | 32 ( 25.2 %)    | ns             |
| acquaintance with friends             | 42 ( 14.2 %)     | 30 ( 17.9 %)    | 12 ( 9.4 %)     | < 0.05         |
| part-time job                         | 17 ( 5.8 %)      | 8 ( 4.8 %)      | 9 ( 7.1 %)      | ns             |
| acquisition of personal qualification | 0 ( 0 %)         | 0 ( 0 %)        | 0 ( 0 %)        | ns             |
| nothing                               | 9 ( 3.1 %)       | 2 ( 1.2 %)      | 7 ( 5.5 %)      | < 0.05         |
| others                                | 2 ( 0.7 %)       | 2 ( 1.2 %)      | 0 ( 0 %)        | ns             |
| <b>Course coincidence</b>             |                  |                 |                 |                |
| yes                                   | 156 ( 52.9 %)    | 90 ( 53.6 %)    | 66 ( 52 %)      | ns             |
| no                                    | 139 ( 47.1 %)    | 78 ( 46.4 %)    | 61 ( 48 %)      | ns             |

Note: Data are shown as numbers (%); "SD" = standard deviation; "ns" = not significant

\**P*-values show significant differences between males and females.

### 3-2. Internet-using time

Figure 1 shows the proportion of respondents by their duration of Internet-using time. The most common response was '2h' (22%), followed by '3h' (20%), '>= 6h' (16%), '5h' (13%), '1h' (12.9%), and '4h' (10%). Surprisingly, 29% of respondents answered 'over 5 hours' a day, while 6% of respondents indicated that they spent no time on the Internet at all.

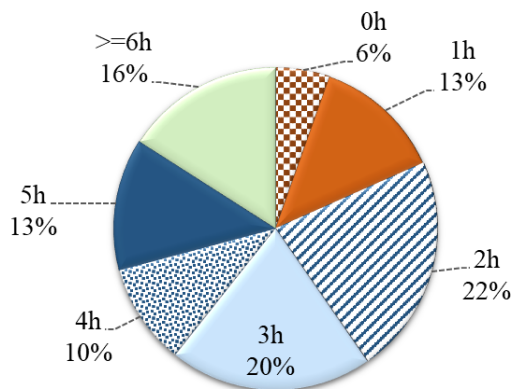


Figure 1. Respondents by duration of Internet use each day. Data are shown as number of hours [h] and percentages [%].

Next this study compared time of Internet use with learning and sleeping time (Figure 2). No patterns were discerned when comparing students in terms of their Internet use and learning time. However, sleep duration was remarkably reduced for students in the categories of longer Internet use ('5 h' and '>= 6h').

For comparison, the evaluation axis was changed from Internet-using time to learning time. Learning time was divided into 4 groups: '0 h', '1 h', '2 h', and

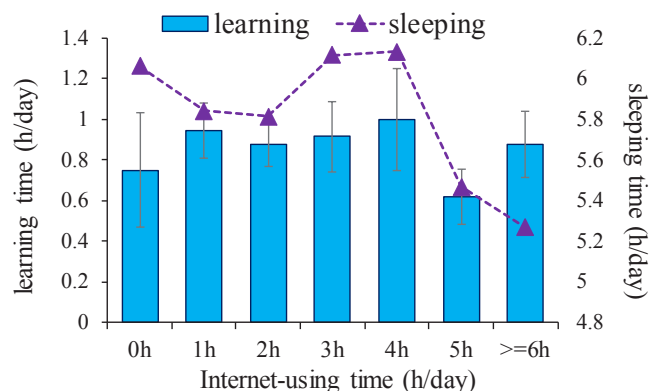


Figure 2. Comparison of average learning time (bar graph) and average sleeping time (line graph) according to Internet use time. Data are shown as number of hours [h].

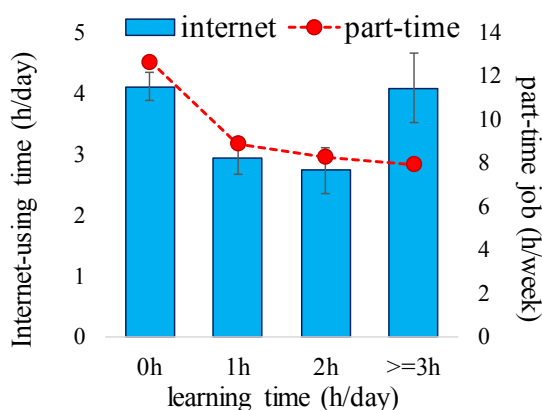


Figure 3. Comparison of average Internet use time (bar graph) and average working time for part-time job (line graph) according to the learning time. Data are shown as number of hours [h].

'>= 3 h'. As seen in Figure 3, the high Internet use group are polarized into the shortest (= 0 h) and longest (>= 3 h) learning groups. Furthermore, it was found that the average duration of part-time work was remarkably long in the shortest learning group (12.7 h) compared with the students working for the greatest duration (7.9 h), and that this difference was significant ( $p < 0.05$ ).

### 3-3. Comparison of Internet-using time and other questionnaire items

Table 2 shows the comparison of the Internet-using time and other items in the questionnaire. To make the comparison clear, Internet use time was divided into 3 groups: '<= 1h', '2-4 h', and '>= 5h'. The results show

that the highest Internet-using group of '>= 5h' showed the shortest duration for learning and sleeping. Learning time showed a significant difference between '<= 1h' and '>= 5h' Internet-using groups ( $0.89 \pm 0.92$  h and  $0.55 \pm 1$  h, respectively) ( $p < 0.05$ ). In contrast, the length of working hours for part-time job increased with the increase in Internet time. This is confirmed in Figure 4. Regarding the questionnaire items for *priority for college life* and the *congruence of course*, significant differences were not confirmed. However, the group with the shortest Internet-using time of '<= 1h' was dominant in their answer of 'learning' for *priority for college life*. In addition, for *course congruence*, the shortest Internet-using group mainly responded 'yes,' i.e. their aspirations and reality were generally in line.

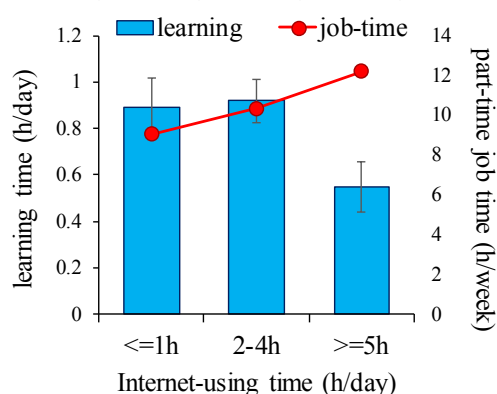


Figure 4. Comparison of average self-learning time (bar graph) and average part-time job time (line graph) according to Internet use time. Data are shown as number of hours [h].

Table 2. Comparison of the questionnaire items between 3 groups divided by Internet use time

|   | <= 1h           | 2-4 h           | >= 5h           | p value |
|---|-----------------|-----------------|-----------------|---------|
|   | 54 ( 18.3 %)    | 155 ( 52.5 %)   | 86 ( 29.2 %)    |         |
| <b>Learning time (h/day)</b>                | $0.89 \pm 0.92$ | $0.92 \pm 1.16$ | $0.55 \pm 1$    | < 0.05  |
| <b>Sleeping time (h/day)</b>                | $5.91 \pm 0.99$ | $5.99 \pm 1.08$ | $5.62 \pm 1.38$ | ns      |
| <b>Working hours for part-time (h/week)</b> | $9.06 \pm 10.9$ | $10.3 \pm 9.49$ | $12.2 \pm 12.2$ | ns      |
| <b>Priority categories in school life*</b>  |                 |                 |                 |         |
| learning                                    | 34 ( 63 %)      | 83 ( 53.5 %)    | 45 ( 52.3 %)    | ns      |
| companionship                               | 4 ( 7.4 %)      | 28 ( 18.1 %)    | 9 ( 10.5 %)     | ns      |
| hobby                                       | 1 ( 1.3 %)      | 3 ( 4.5 %)      | 1 ( 1.3 %)      | ns      |
| <b>Coincidence of course</b>                |                 |                 |                 |         |
| yes   | 33 ( 61.1 %)    | 77 ( 49.7 %)    | 46 ( 53.5 %)    | ns      |
| no  | 21 ( 38.9 %)    | 78 ( 50.3 %)    | 40 ( 46.5 %)    | ns      |

Note: Data are shown as numbers (%); "SD" = standard deviation; "ns" = not significant  
P-values show significant differences between "<= 1h" and ">= 5h".

\*) Answerers are limited to responders who selected the applicable question items.

Table 3. Overview of descriptive analysis of variables

| Variables         | <i>N</i> | Correlation Coefficient | <i>t</i> -value | <i>p</i> -value | <i>t</i> (0.975) |
|-------------------|----------|-------------------------|-----------------|-----------------|------------------|
| Internet-Learning | 294      | -0.104753367            | -1.8030085      | 0.0724142       | 1.9680935        |
| Internet-Job      | 294      | 0.08325447              | 1.4300517       | 0.1537677       | 1.9680935        |
| Internet-Sleeping | 294      | -0.111729082            | -1.921257       | 0.0556727       | 1.9681214        |
| Learning-Job      | 294      | -0.164667766            | -2.8576679      | 0.0045734       | 1.9680935        |
| Learning-Sleeping | 294      | -0.124881775            | -2.1508181      | 0.0323111       | 1.9681214        |
| Job-Sleeping      | 294      | -0.218976346            | -3.8349429      | 0.0001539       | 1.9681214        |

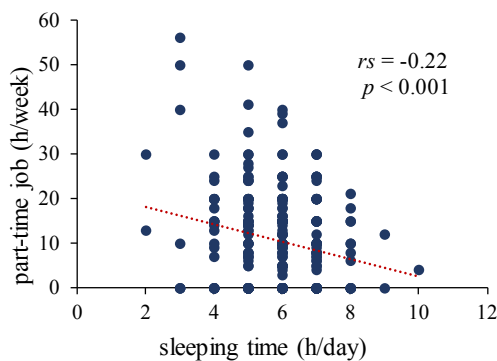


Figure 5. Result of correlation coefficient between working hours for part-time job [h/week] and sleeping time [h/day]. The data are shown as number of hours [h].

Next, this study examined the correlation among all questionnaire items. Table 3 shows the descriptive analysis of variables. Regarding Internet-using time, no variable indicated a clear correlation. A weak correlation was confirmed between working hours for part-time job and sleeping time (Job – Sleeping) ( $r = -0.22, p < 0.001$ ) (Figure 5).

#### 4. Discussion

To detect degree of influence for learning environment at college, this study surveyed students' actual Internet use. The average Internet use time of 3.62 h obtained in this study is equal to that reported in Japanese youth in 2018<sup>3)</sup>. Additionally, the proportion of respondents using the Internet over 2 hours a day is the same as cited in that report<sup>3)</sup> (82.7% in this study, 82.6% in the Japanese report). However, the relatively large proportion (15.9%) of students using the Internet for more than 6 hours in this study is a matter of great concern. According to

the Chinese Ministry of Health, staying online more than six hours a day and having adverse reactions from not being able to go online, are symptoms of Internet addiction disorder<sup>6)</sup>. Internet addiction is defined as a non-chemical or behavioral addiction that involves human-machine interaction, which can either be passive, such as viewing movies, or active, such as playing computer games<sup>7)</sup>. A previous study reported that 15% of university students in the United States and Europe acknowledge that they are addicted to the Internet<sup>2)</sup>. Internet addiction ranging from 2.4% to 37.9% has been reported in China, Hong Kong and Taiwan<sup>8)</sup>. 'Internet addiction disorder' is not officially recognized as a disorder by the psychiatric community, and whether all over-use of the Internet corresponds to Internet addiction disorder is unclear. Nonetheless, it is clearly a serious problem as students are deprived of much free time which they could use to engage in other useful activities.

In relation to Internet use and living environment of students, this study revealed that high Internet users (over 5 hours a day) demonstrate short learning time, short sleeping time, and long working hours in their part-time jobs. Regarding the learning and sleeping time, it is obvious that long periods on the Internet deprive students of free time, which could be spent learning or sleeping. However, it is interesting that high Internet use raises working hours. This study revealed that high Internet users are polarized into the shortest (= 0h) and longest ( $\geq 3h$ ) learning groups. The long duration learning group may demonstrate the convenience of using surveys on the Internet for study purposes. In contrast, the shortest learning group spent more time on part-time work even in the context of

reduced sleep. One reason behind this may be that these students have lost their sense of purpose and motivation to become medical specialists. In fact, this study showed that students with high rates of *course congruence* were more likely to be lower Internet users ( $\leq 1$ h). Additionally, the lowest Internet-using group was dominant in indicating 'learning' as their *priority for college* life. For some students with low motivation for learning, heavy Internet use or excessive engagement with part-time work will help stave off boredom. For students aiming to be medical specialists, establishing a firm sense of purpose for one's future is important to foster learning motivation. This sense of purpose may lead to increased levels of independent study and a greater awareness of one's learning environment.

Some studies have reported that males are more likely to exhibit Internet addictive behavior than females<sup>9-11)</sup>, while others reported that female students were more addicted to the Internet than males<sup>12)</sup>. Generally it is noted that the highest ranked online activities are watching videos, frequenting chat rooms and social networking; significantly higher rates of playing single-user games were found in males while social networking is more popular among females<sup>9)</sup>. The present study revealed a statistically significant difference in Internet use between females and males, with females spending longer on the Internet. One reason for this could be that females spend longer learning than males. Because a large volume of information for research can be obtained rapidly and effectively using the Internet, the Internet use time could be higher for females.

As for *physical condition*, several studies have reported negative impacts of Internet addiction including physical problems due to prolonged use of the Internet such as migraines, tension headaches, and disrupted sleep patterns<sup>13-15)</sup>. Duration of sleep time can be used to evaluate respondents' passion for surfing the Internet. In contrast, the fatigue faced by Internet users will also determine the impact of Internet addiction on young working adults<sup>2)</sup>. Migraine or other headache problems will also show

the negative effects associated with excessive Internet use<sup>16-17)</sup>. This study showed that the most common symptoms of poor physical condition are fatigue, following by listlessness, and reduced sleep. Each of the symptoms reported were more dominant in female than male students with significant differences reported between genders. The difference could be related to longer Internet use in females. A significant relationship between physical condition and Internet-using time was not demonstrated in this study, however further research is needed to clarify the nature of the relationship.

The Internet brings the world close together today, and has many positive applications such as conducting research, performing business transactions and communications, accessing library materials, and communicating with friends and family. However, some individuals misuse it and become obsessed with the exposure and opportunities that it brings<sup>16)</sup>. Social networking is the most popular Internet activity, followed by gambling and gaming. In a previous study, 92% of the total sample were members of at least one social networking site. Some 39.4% of adolescents spend at least two hours on social networking sites on a normal school day<sup>9)</sup>. Gambling, social networking and gaming are strongly associated with dysfunctional Internet behavior, while watching videos/movies is not related to dysfunctional behavior and doing homework/research is negatively associated with dysfunctional outcomes<sup>9)</sup>. Our result of 29.2% students using the Internet for more than 5 hours cannot be overlooked. As a university educating medical professionals, we have a responsibility to create a suitable learning environment for students and prevent Internet addiction. This study suggests that a firm sense of purpose is important to foster a higher awareness of the job requirements, leading to increased learning motivation instead of overuse of the Internet.

Several limitations of this study should be considered. First, the study could not observe changes over time in a specified grade. Second, more data are needed to confirm the study results. Third, data from

other facilities are needed for comparison to confirm the hypotheses of this study.

In conclusion, this study demonstrated that Internet-using time is higher in females than males. Those who use the Internet for long periods of time (over 5 hours a day) comprised 29.2% of respondents in our sample. This group had little time left for learning and sleeping, but still spent a substantial amount of time on part-time jobs. Those students who spend less time on the Internet were more likely to indicate 'study' as their priority for college life, and congruence in their choice of course. This study suggests that prolonged Internet use can result in loss of purpose to become a medical specialist. Establishing a firm sense of purpose for one's future could be an essential factor to foster learning motivation, leading to increased levels of independent study and greater awareness of the learning environment.

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