Phubbing as a Millennials' New Addiction and Relating Factors Among Nursing Students

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Objective   This study investigated phubbing (the act of ignoring one's companion or companions to pay attention to one's smartphone) and examined the factors affecting phubbing among nursing students in South Korea.

Methods   A cross-sectional survey design was adopted, and a self-reported questionnaire was used. Data were collected from 200 nursing students in two cities. Self-administered questionnaires included demographic data, smartphone addiction, media multitasking motivation, interpersonal competency, and phubbing.

Results   Phubbing was positively correlated with smartphone addiction (r=0.41, p<0.001) and media multitasking motivation (r=0.16, p<0.05), and negatively correlated with interpersonal competence (r=-0.51, p<0.001). Factors influencing nursing students' phubbing were interpersonal competency (β=-0.59, p<0.001), media multitasking motivation (β=0.24, p<0.001), smartphone addiction (β=0.19, p<0.01) and interpersonal relationships (β=0.14, p<0.05). The model including these variables accounted for 43% of variance in phubbing.

Conclusion   Nursing students showed a moderate level of phubbing, and interpersonal competency was an important factor for reducing their phubbing of nursing students. Since phubbing occurs frequently among nursing students, educators in nursing are required to develop and implement active interventional measures to help nursing students avoid phubbing and improve their interpersonal relationships by increasing their empathic ability and communication skills.   **Psychiatry Investig 2022;19(2):135-145**

Keywords   Smartphone; Addiction; Social competence; Multitasking behavior; Nursing students.

INTRODUCTION

The millennial generation includes people born between the early 1980s and early 2000s, who are generally proficient in the use of information technology and very familiar with digital devices such as smartphones. Smartphones are now an indispensable part of daily life, as they are used not only for communication, but also for numerous other activities such as information searching, entertainment, and commercial transactions. However, growing concerns have been raised about the adverse effects of smartphone use.[1] Among adult smartphone users in Korea, 18.1% in 2018 and 18.8% in 2019 were

reported to be at-risk for overdependence on mobile devices.[2] The highest average daily time spent on smartphones was found among younger millennials in their 20s and 30s, and especially among college students.[3]

College students use smartphones to form social relationships, acquire information acquisition, and engage in academic and leisure activities; therefore, in light of the broad applications of smartphones, smartphone overdependence is expected to become more severe among college students.[4] A study among undergraduates showed associations between smartphone overuse and various problems, such as fewer in-person conversations, an increased burden of monthly mobile phone charges, and privacy concerns; additionally, a higher degree of smartphone addiction was found to be associated with a higher level of learning disorders and ADHD.[5,6] In addition, excessive smartphone users have been reported to show decreased interest in activities other than smartphone use and to experience anxiety symptoms and difficulty focusing without the smartphone in hand. Smartphone overuse thus prevents college students from accomplishing their developmental tasks in an appro-

priate way and may even cause maladjustment in college life.[7] Since college students attain interpersonal closeness through developmental tasks during the undergraduate period, the negative impacts of excessive smartphone use on interpersonal relationships are likely to affect their future quality of life as well.[6] In addition, for nursing students, efficient communication with patients is a core capacity of nursing skills, and smartphone overuse can hinder them from acquiring effective communication skills and interpersonal relationships.

Since smartphones are used to maintain social relationships and communicate with others, an ironic, but frequently-observed phenomenon is that people have trouble paying attention to their companion or conversation partner while using a smartphone. This phenomenon is called "phubbing," a portmanteau word formed by combining "phone" and "snubbing" that refers to the act of ignoring one's companion or companions in order to pay attention to one's smartphone. Phubbing should not be considered a simple problem; instead, it is a novel and dangerous form of technology addiction that affects the psychological and social domains of human beings.[8] Many classes are now conducted fully or partially online due to the spread of COVID-19, and this transition to online classes has given students more opportunities to use smartphones in class instead of focusing on the class. As a result, cases of classroom phubbing (i.e., students' use of smartphones during lectures) have been frequently reported.[9] According to a previous study, students tend to spend increasingly more time per day on the smartphone since they think that their peers make more use of mobile devices. According that study, 41% of the students surveyed said that they checked their smartphones at least once in class in order to use a social networking site, check messages through WhatsApp (a mobile messaging app similar to KakaoTalk), or surf the internet to search for something unrelated to the contents of the class. In addition, 80% of students using smartphones in class responded that they experienced reduced concentration during classes and failed to understand some course content.[10] These results show the necessity of preventing phubbing through appropriate interventions and education and providing nursing students with guidance on the proper use of smartphones.

Moreover, since phubbing involves smartphone addiction and media multitasking, which are typical characteristics of the digital generation, it is highly likely to hinder the development of the interpersonal skills of undergraduate students. Smartphone addiction is defined as "the state in which the individual exhibits major characteristics of addiction such as tolerance, withdrawal symptoms, and control loss in relation to the use of the smartphone, and consequently experiences daily living disability."[11] Media multitasking refers to simultaneously performing two or more tasks using one or more forms of media.[12]

A media environment where the smartphone penetration rate reaches 95% is considered a structural factor that can increase multitasking, and modern people's information-seeking, entertainment-seeking, and sensation-seeking traits can be regarded as a psychological contributing factor. The interaction of these two factors is expected to increase media multitasking.[13] To understand the phubbing phenomenon and to establish preventive strategies to reduce phubbing, it is necessary to identify relationships between smartphone addiction, media multitasking, and interpersonal competency and examine their effects on phubbing.

Previous studies on phubbing are largely divided into research on phubbing and jealousy between people of the opposite gender and investigations of factors influencing phubbing.[14] Since research on phubbing is still at an early stage, very few studies have investigated factors affecting phubbing. Previous studies on factors influencing phubbing investigated factors associated with technology addiction.[15] Research has also investigated the personality traits of individuals (boredom, narcissism, and conscientiousness) in association with phubbing[16] and phubbing among parents and caregivers.[17]

In situations where the non-face-to-face classes predominantly given to, phubbing of nursing students are likely to increase with Corona pandemic. Phubbing has been regarded as an addiction, and if it continues, it might compromise the quality of patient care. Efforts are needed to investigate and prevent phubbing of nursing student, who have been able to come forward to support our services over this challenging time. In this study, we investigated phubbing, focusing on smartphone addiction and media multitasking in nursing student. In particular, we attempted to determine the levels of smartphone addiction, media multitasking, interpersonal competency, and phubbing among undergraduate students and to identify factors influencing phubbing. The study findings may serve as basic data for reducing phubbing and preventing smart phone addiction in the future research.

METHODS

Design and participants

This study was a cross-sectional descriptive survey. We investigated nursing students in two regional universities in the Republic of Korea. The researcher and two research assistants collected data with the cooperation of the head of the Department of Nursing of the university. The participants were selected by the non-probability sampling technique among currently-enrolled nursing students who were smartphone users, had no other professional relationship with the researcher, and did not take classes or training courses taught by the researcher.

Sample size

To determine the appropriate sample size, the sample size for multiple linear regression analysis was computed using the G*Power (version 3.1.7, Buchner, Erdfelder, Faul & Lang, Kiel, Germany). Regarding the appropriate sample size for the analysis methods used, the minimum sample size was calculated to be 160 with the significance level of 0.05, power of 0.95, and effect size of 0.15, and the sample size was set as 200 considering the dropout rate of 25%. A high dropout rate was assumed due to the voluntary participation of participants. Excluding 3 people due to insufficient or missing data, a total of 197 people were included in the final analysis.

Data collection

Willing participants received written information containing a brief description of the study. Questionnaires were then distributed to the participants, who completed the questionnaire at the site and returned it to the researcher. The research assistants fully informed the participants about the study purpose, the principle of voluntary participation, and their right to withdraw from the study at any time before distributing the questionnaires, which included informed consent forms. The survey was carried out anonymously. It took approximately 10 to 15 minutes for each participant to complete the questionnaire. In addition, the participants were given a 4-dollar gift as a token of appreciation for their participation. The data were collected from May 5 to August 28, 2020.

Measurement

This study used a structured, self-administered questionnaire. The assessment tool consisted of a total of 86 items, including 11 items on nursing students' general characteristics, 9 items on phubbing, 15 items on smartphone addiction, 20 items on media multitasking motivation, and 31 items on interpersonal competency. This instrument was used after obtaining permission from the authors.

Phubbing scale

Phubbing was assessed using a modified version of the tool developed by Roberts and David[18] This modified version, which was proposed by Lee[19] consists of 9 items. Each item was assessed on a 5-point Likert scale (1=Never, 2=Rarely, 3=Occasionally, 4=Frequently, 5=Always). The total scores ranged from 9 to 45 points, with higher scores indicating higher levels of phubbing. Cronbach's α was 0.87 in Lee[19] and 0.89 in the present study.

Smartphone Addiction Proneness Scale

Smartphone addiction tendency was measured using the Smartphone Addiction Proneness Scale for Adults developed

by Kim et al.[20] This self-assessment tool is composed of 15 items, which are divided into 3 subdomains: daily living disability, withdrawal, and tolerance. Each item is graded on a 4-point Likert scale (1=Strongly disagree, 2=Disagree, 3=Agree, 4=Strongly agree), and total scores ranged from 15 to 60 points. Items 4, 10, and 15 are reverse-coded. Individuals with a total score of 44 points or higher, 15 points in one construct, or 13 points or higher in three constructs were classified as the high-risk group, and those with a total score of 40 to 43 points or 14 points or higher in one subdomain were classified as the potential-risk user group. Other respondents were classified as the normal user group. Cronbach's α was 0.81 when the tool was developed. In the present study, Cronbach's α for the total scale was 0.90 and was 0.75 for daily living disability, 0.79 for withdrawal, and 0.79 for tolerance.

Media multitasking motivation scale

Media multitasking motivation was measured using a 20-item tool developed by Hwang et al.,[21] divided into five subdomains: information, society, efficiency, enjoyment, and habit. The items are rated on a 5-point Likert scale (1=Strongly disagree, 5=Strongly agree). The total scores range from 20 to 100 points. Hwang et al.[21] reported that Cronbach's α of each subdomain was as follows: 0.93 for information, 0.91 for society, 0.83 for efficiency, 0.88, for fun, and 0.80 for habit. In this study, Cronbach's α for the total scale was 0.94, and Cronbach's α for each subdomain was 0.81 for information, 0.88 for society, 0.79 for efficiency, 0.81 for fun, and 0.84 for habit.

Interpersonal competence scale

Interpersonal competence was measured using a modified Korean version of the Interpersonal Competence Questionnaire (ICQ) developed by Buhrmester et al.[22] The Korean version of the ICQ was developed through modification of the original tool to make it suitable for Koreans and was validated among Koreans by Han and Lee.[23] This scale is composed of 31 items and five subdomains as follows: eight items regarding initiating relationships, seven items regarding asserting displeasure with another's behavior, seven items regarding providing emotional support, six items regarding conflict management, and three items regarding self-disclosure. The items are rated on a 5-point Likert scale (1=Strongly disagree, 5=Strongly agree). Total scores range from 31 to 155, with higher scores indicating higher levels of interpersonal competence. In the study of Han and Lee,[23] Cronbach's α of the total scale was 0.92, and it was 0.91 for initiating relationships, 0.82 for asserting displeasure with another's behavior, 0.86 for providing emotional support, 0.84 for conflict management, and 0.73 for appropriate self-disclosure. In this study, Cronbach's α for the instrument was 0.93, and it was 0.88 for initiating relation-

ships, 0.82 for asserting displeasure with another's behavior, 0.82 for providing emotional support, 0.83 for conflict management, and 0.89 for self-disclosure.

Data analysis

All statistical analyses were performed using SPSS (version 23, IBM Corp., Armonk, NY, USA). Statistical significance was set at $p<0.05$. The general characteristics and research variables of the participants were analyzed using descriptive statistics and percentages. Differences in the levels of phubbing, smartphone addiction, media multitasking motivation, and interpersonal competency by participants' general characteristics were analyzed by performing the independent t-test or one-way ANOVA, and post-hoc analysis was conducted using the Scheffe test. Pearson correlation coefficients were used to quantify the relationships among phubbing, smartphone addiction, media multitasking motivation, and interpersonal competence. To explore factors influencing phubbing, significant variables derived from analyses of differences and correlation analyses were input into multiple regression with the "enter" method.

Ethical considerations

The study was reviewed and approved by the Institutional Review Board (IRB No.: KNU_IRB_2020-20). The study purpose and methods were described in detail in documents, and each participant provided written informed consent. The questionnaires included the study identification number, and participants were not asked to provide their names during research.

RESULTS

General characteristics of participants

Most participants were female (n=133; 67.5%). The mean age of participants was 22.7 years, and 60.4% were under the age of 23. The participants consisted of 49 freshmen (24.9%), 36 sophomores (18.3%), 63 juniors (32.0%), and 49 seniors (24.9%). Slightly fewer than half of the respondents (n=91; 46.2%) expressed moderate satisfaction with their major. The GPA for the previous semester was 3.5–3.99 for 87 respondents (44.2%) and 4.0 or higher for 50 (25.4%). Ninety-eight respondents (45.2%) rated their interpersonal relationships as generally good. The average time spent per day on a smartphone was 6.4 hours and the average daily sleep duration was 7.79 hours. Sleep quality was rated as good by 43 participants (21.8%) and as poor by 107 (54.3%). Regarding smartphone addiction, 124 participants (62.9%) were classified as normal users, 24 (12.2%) were in the potential-risk group, and 49 (24.9%) were in the high-risk group (Table 1).

Phubbing, smartphone addiction, media multitasking motivation, and interpersonal competency

The average phubbing score was 26.51 points out of 45. For

Table 1. General characteristics of participants (N=197)

Characteristics	N (%)	M±SD
Gender		
Male	64 (32.5)	
Female	133 (67.5)	
Age (yr)		22.69±2.56
<23	119 (60.4)	
≥23	78 (39.6)	
Grade		
1st	49 (24.9)	
2nd	36 (18.3)	
3rd	63 (32.0)	
4th	49 (24.8)	
Satisfaction of major		
Satisfied	81 (41.1)	
Moderate	91 (46.2)	
Unsatisfied	25 (12.7)	
GPA (point)		
≤2.99	15 (7.6)	
3.0−3.49	45 (22.8)	
3.5−3.99	87 (44.2)	
≤4.0	50 (25.4)	
Interpersonal relationship		
Good	89 (45.2)	
Moderate	60 (30.5)	
Bad	48 (24.3)	
Smartphone usage time per day (hr)		6.44±2.96
<6	94 (47.7)	
6−9	89 (45.2)	
≤10	14 (7.1)	
Duration of sleep (hr)		7.79±1.48
< 6	36 (18.3)	
6−9	133 (67.5)	
≤10	28 (14.2)	
Quality of sleep		
Good	43 (21.8)	
Moderate	47 (23.9)	
Bad	107 (54.3)	
Smartphone addiction		
High risk	49 (24.9)	
Potential risk	24 (12.2)	
General	124 (62.9)	

GPA, grade point average

smartphone addiction, the average score was 35.66 points out of 55, and the average score for media multitasking motivation was 71.51 points out of 100. For interpersonal competence, the average score was 112.41 points out of 155. Details of the subdomain scores are provided in Table 2.

The average phubbing score was 26.51 points out of 45. For smartphone addiction, the average score was 35.66 points out of 55, and the average score for each subdomain was 12.18 points out of 20 for daily living disability, 8.60 points out of 16 for withdrawal symptoms, and 11.19 points out of 16 for tolerance. The average score for media multitasking motivation was 71.51 points out of 100, and the average score of each subdomain was as follows: 19.84 points out of 25 for information, 17.07 points out of 25 for society, 13.47 points out of 20 for efficiency, 10.28 points out of 15 for enjoyment, and 10.85 points out of 15 for habit. For interpersonal competence, the average score was 112.41 points out of 155, and the average score of each subdomain was as follows: 28.28 points out of 40 for initiating relationships, 24.31 points out of 35 for asserting displeasure with another's behavior, 27.27 points out of 35 for providing emotional support, 23.06 points out of 30 for conflict management, and 9.45 points out of 15 for appropriate self-disclosure (Table 2).

Differences in phubbing, smartphone addiction, media multitasking motivation, and interpersonal competency by participants' general characteristics

Statistically significant differences were found in the degree of phubbing by age, class standing, interpersonal relationships, and daily smartphone usage time. Respondents under the age of 23 showed a higher level of phubbing than those aged 23 and older (t=4.27, p<0.001), and freshmen showed a significantly higher level of phubbing than students with other class standings (t=11.26, p<0.001). The group with poor interpersonal relationships showed a significantly higher level of phubbing than those with good interpersonal relationships (t=5.73, p=0.004), and those who spent more than 10 hours per day on the smartphone had a significantly higher level of phubbing than those who spent less than 6 hours per day on the smartphone (t=5.22 p=0.006).

Significant differences were found in the level of smartphone addiction by class standing, major satisfaction, interpersonal relationships, time spent per day on the smartphone, and sleep quality. Sophomores showed a significantly higher level of smartphone addiction than students with other class standings, and juniors showed a higher level of smartphone addiction than seniors (t=4.71, p=0.003). The level of smartphone addiction was higher in those who were dissatisfied with their major than in those who were satisfied (t=10.50, p<0.001). Respondents with poor interpersonal relationships showed a significantly higher level of smartphone addiction than those with good interpersonal relationships (t=4.37, p=0.014). The level of smartphone addiction was significantly higher in those who spent more than 10 hours per day on smartphones than in those who spent less than 6 hours per day on smartphones (t=14.21, p<0.001). Respondents with poor sleep quality also showed a sig-

Table 2. Level of smartphone addiction, media multitasking motivation, interpersonal competence and phubbing (N=197)

Variable	Range	Min	Max	M±SD	Out of 5 score
Phubbing	9–45	10	45	26.51±7.77	2.95±0.85
Smartphone addiction	15–60	15	55	35.66±9.25	2.38±0.34*
Daily living disability	5–20	5	20	12.18±3.58	
Withdrawal	4–16	4	16	8.60±3.09	
Tolerance	4–16	4	16	11.19±2.71	
Media multitasking motivation	20–100	31	100	71.51±14.21	3.58±0.71
Information	5–25	10	25	19.84±3.35	
Social	5–25	6	25	17.07±4.66	
Efficiency	4–20	4	20	13.47±3.20	
Enjoyment	3–15	3	15	10.28±2.95	
Habit	3–15	3	15	10.85±2.93	
Interpersonal competence	31–155	20	155	112.41±17.43	3.63±0.56
Initiating relationships	8–40	12	40	28.28±6.24	
Asserting displeasure with another's behavior	7–35	11	35	24.31±5.21	
Providing emotional support	7–35	12	35	27.27±4.19	
Conflict management	6–30	10	30	23.06±3.27	
Self-disclosure	3–15	3	15	9.45±2.58	

*out of 4 score

nificantly higher level of smartphone addiction than those with good sleep quality (t=3.09 p=0.048).

There were significant differences in the level of media multitasking motivation by class standing, interpersonal relationships, and daily sleep duration. Specifically, the level of media multitasking motivation was higher in sophomores than in freshmen, and in freshmen and sophomores than in seniors (t=15.18, p<0.001). Respondents with good interpersonal relationships showed a higher level of media multitasking motivation than those with poor interpersonal relationships (t= 3.12, p=0.046), and a daily sleep duration of more than 9 hours was associated with a higher level of media multitasking motivation (t=4.31, p=0.015).

Interpersonal competence showed significant relationships with gender, age and class standing. Males showed a higher level of interpersonal competence than females (t=2.38, p= 0.024), and the level of interpersonal competence was higher in respondents aged 23 and older than in those under the age of 23 (t= -9.62, p<0.001). Regarding class standing, seniors showed the highest level of interpersonal competence (t=80.71, p<0.001) (Table 3).

Relationships between phubbing, smartphone addiction, media multitasking motivation, and interpersonal competence

Phubbing was positively correlated with both smartphone addiction (r=0.41, p<0.001) and media multitasking motivation (r=0.16, p<0.021), but it was negatively correlated with interpersonal competence (r=-0.51, p<0.001). Smartphone addiction was positively correlated with media multitasking motivation (r=0.33, p<0.001), while it had a negative correlation with interpersonal competence (r=-0.19, p=0.006). Media multitasking motivation had a positive correlation with interpersonal competence (r=0.28, p<0.001) (Table 4).

Factors affecting phubbing in nursing students

To identify factors affecting phubbing among nursing students, multiple regression analysis was conducted. Phubbing was the dependent variable, and the independent variables included variables that were significantly correlated with phubbing in the correlation analysis, such as smartphone addiction, media multitasking motivation, and interpersonal competency, as well as general characteristics that showed correlations with phubbing (age, class standing, interpersonal relationship, daily smartphone usage time, and sleep quality) (Table 5). The Durbin-Watson statistic was 2.217, the tolerance was 1.000, higher than 0.1, and the variance inflation factor was 1.000, smaller than 10, indicating that there was no problem of multicollinearity. In the regression analysis, the adjusted R^2, which represents the explanatory power of the model, was 0.43—that

is, the model explained 43% of the variance in phubbing. Interpersonal competency and media multitasking motivation had the greatest impact on phubbing, followed by smartphone addiction and interpersonal relationships. Lower interpersonal competency (β=-0.59, p<0.001), a higher level of media multitasking motivation (β=0.24, p<0.001), a higher level of smartphone addiction (β=0.19, p=0.004), and poor interpersonal relationships (β=0.14, p=0.049) were associated with a higher level of phubbing.

DISCUSSION

This study aimed to examine the current status of phubbing among nursing students, to explore the relationships between smartphone addiction, media multitasking motivation, and interpersonal competency, and to identify factors affecting phubbing in order to provide basic data for the prevention of phubbing. Interpersonal competency, media multitasking motivation, smartphone addiction, and interpersonal relationships were found to be major factors explaining phubbing among nursing students.

The average time that participants spent per day on the smartphone was 6.44 hours, which is higher than the average of 4.9 hours spent daily on mobile devices in Korean adults.[24] It is also higher than the values of 2.5 hours among general undergraduate students[25] and 2.24 hours among nursing students[26] reported in previous studies. The average score for smartphone addiction was 35.66±9.25 points out of 60 points, corresponding to the normal user group. This result is similar to the average of 36.99 points among nursing students obtained using the same instrument by Im and Noh,[27] and it is also similar to the score of 35.5 points reported by Kim.[28] The high-risk user group and the potential-risk user group comprised 24.9% and 12.2% of participants, respectively, which indicates that more than a third of nursing students experience daily living disability or addiction symptoms such as withdrawal symptoms and tolerance in relation to smartphone use. Thus, some caution is needed regarding the use of smartphones among nursing students.

The average score for media multitasking motivation was 71.51 points out of 100, which indicates a moderate level, although it is difficult to make comparisons with other studies because of the lack of prior research using the same instrument. The average score for interpersonal competency was 112.41 points out of 188, which is a relatively high level. Providing emotional support was the subdomain with the highest average score, followed by conflict management, initiating relationships, asserting displeasure with another's behavior, and self-disclosure in descending order. In this study, the average score for interpersonal competency was 3.63 points, which is higher than the score of 3.34 points out of 5 that Cho[29] obtained using

the same instrument among nursing students. The average score for phubbing was 2.59 points out of 5, which represents a moderate level of phubbing; however, this score is markedly higher than that of 2.53 points measured on a 10-point scale among undergraduates[30] using the instrument developed by Karadağ

et al.[31] Altogether, a considerable level of phubbing was found among nursing students.

In this study, regression analysis showed that interpersonal competency had the strongest impact on phubbing among nursing students, and a lower level of interpersonal compe-

Table 3. Differences in the phubbing, smartphone addiction, media multitasking motivation and interpersonal competence (N=197)

Characteristics	Phubbing		Smartphone addiction		Media multitasking motivation		Interpersonal competence	
	M±SD	t/F (p)	M±SD	t/F (p)	M±SD	t/F (p)	M±SD	t/F (p)
Gender		-1.36 (0.164)		-1.74 (0.084)				2.38 (0.024)
Male	2.82±0.85		2.27±0.61		3.53±0.69	-0.66 (0.508)	3.76±0.60	
Female	3.00±0.92		2.43±0.62		3.60±0.72		3.56±0.53	
Age (yr)		4.27 (<0.001*)		1.82 (0.082)				-9.62 (<0.001)
<23	3.15±0.87		2.44±0.56		3.51±0.69	-1.64 (-0.169)	3.36±0.39	
≥23	2.62±0.86		2.28±0.68		3.68±0.74		4.04±0.54	
Grade		11.26 (<0.001*)		4.71 (0.003*)		15.18 (<0.001*)		80.71 (<0.001*)
1st grade[a]	3.43±0.85	a>b, c, d	2.24±0.54	b>a, c, d	3.11±0.57	a<b,	3.15±0.37	a, b, c<d
2nd grade[b]	3.04±0.87		2.61±0.64	c>d	3.94±0.63	a, b>d	3.47±0.38	
3rd grade[c]	3.00±0.82		2.49±0.53		3.53±0.66		3.56±0.38	
4th grade[d]	2.40±0.82		2.24±0.54		3.83±0.72		4.30±0.38	
Satisfaction of major		1.10 (0.336)		10.50 (<0.001*)		2.37 (0.096)		0.77 (0.477)
Satisfied[a]	2.86±0.93		2.20±0.67	a, b<c	3.60±0.79		3.67±0.55	
Moderate[b]	3.00±0.82		2.42±0.53		3.48±0.65		3.69±0.63	
Unsatisfied[c]	2.95±0.86		2.80±0.19		3.82±0.61		3.54±0.59	
GPA		2.05 (0.109)		0.86 (0.465)		0.78 (0.505)		0.24 (0.871)
≤2.99[a]	3.03±0.58		2.42±0.62		3.37±0.57		3.54±0.59	
3.0−3.4[b]	3.04±0.92		2.28±0.64		3.57±0.68		3.60±0.55	
3.5−3.9[c]	3.03±0.97		2.45±0.63		3.64±0.73		3.66±0.59	
≥4.0	2.67±0.81		2.33±0.68		3.53±0.75		3.62±0.52	
Interpersonal relationship		5.73 (0.004*)		4.37 (0.014*)		3.12 (0.046*)		1.46 (0.236)
Good[a]	2.78±0.92	a<c	2.29±0.62	a<c	3.68±0.72	a>c	3.70±0.57	
Moderate[b]	2.89±0.83		2.32±0.58		3.62±0.71		3.59±0.53	
Bad[c]	3.31±0.88		2.60±0.61		3.39±0.70		3.54±0.59	
Smartphone usage time		5.22 (0.006*)		14.21 (<0.001*)		1.13 (0.325)		1.66 (0.192)
<6[a]	2.74±0.87	a<c	2.15±0.61	a<c	3.53±0.72		3.69±0.54	
6−10[b]	3.10±0.89		2.58±0.54		3.58±0.72		3.55±0.58	
>10[c]	3.33±0.91		2.64±0.59		3.84±0.59		3.70±0.59	
Hours of sleep		1.69 (0.188)		1.79 (0.169)		4.31 (0.015*)		0.38 (0.684)
<6[a]	2.88±1.05		2.35±0.69		3.49±0.68	a<c	3.69±0.62	
6−9[b]	2.90±0.83		2.34±0.59		3.62±0.78		3.62±0.54	
>9[c]	3.23±1.00		2.58±0.63		3.91±0.67		3.58±0.59	
Sleep quality		1.74 (0.178)		3.09 (0.048*)		0.35 (0.706)		1.68 (0.189)
Good[a]	3.14±0.87		2.20±0.60		3.55±0.73		3.57±0.61	
Moderate[b]	2.99±0.80		2.52±0.58		3.51±0.61		3.53±0.57	
Bad[c]	2.84±0.95		2.39±0.63		3.61±0.74		3.69±0.54	

*scheffe test. GPA, grade point average

Table 4. Correlation among smartphone addiction, medial multitasking motivation, interpersonal competence and phubbing (N=197)

Variables	Smartphone addiction r (p)	Media multitasking motivation r (p)	Interpersonal competence r (p)
Smartphone addiction	1		
Media multitasking motivation	0.33 (<0.001)	1	
Interpersonal competence	-0.19 (0.006)	0.28 (<0.001)	1
Phubbing	0.41 (<0.001)	0.16 (0.021)	-0.51 (<0.001)

Table 5. Predictors of phubbing (N=197)

Variables	B	SE	β	t	p
(Constant)	4.11	0.49		8.44	<0.001
Age (1=<23)*	0.05	0.13	0.03	0.34	0.731
Grade (1=1st grade)*	0.05	0.07	0.06	0.75	0.453
Interpersonal relationship (1=bad)*	0.15	0.08	0.14	1.95	0.049
Smartphone usage time (1=>10)*	0.17	0.14	0.18	1.18	0.241
Sleep quality (1=bad)*	-0.11	0.08	-0.13	-1.28	0.203
Smartphone addiction	0.28	0.10	0.19	2.94	0.004
Media multitasking motivation	0.31	0.08	0.24	3.81	<0.001
Interpersonal competence	-0.94	0.14	-0.59	-6.86	<0.001
F (p)=17.93 (<0.001)					
R^2=0.412					
Adj.R^2=0.433					

*dummy variables

tency was associated with a higher level of phubbing. Several empirical studies have demonstrated that interpersonal competency is closely linked to mental health. In particular, it has been reported that poor interpersonal relationships lead to anxiety, which reduces interpersonal competency, thereby increasing the likelihood of experiencing loneliness.[32] These findings imply that anxiety, loneliness, and stress have a negative impact on interpersonal relationships and thereby increase phubbing.[15,33] It has also been reported that phubbing is highly likely to cause more severe conflicts and jealousy of one's companion or companions.[34] Phubbing weakens or undermines empathic interest, closeness, and interpersonal trust,[35] and leads to a vicious cycle—as the length of time spent phubbing another person increases, empathy between the two people decreases, and the relationship quality deteriorates.[36] Since phubbing occurs frequently among nursing students, educators in nursing are required to develop and implement active interventional measures to help nursing students avoid phubbing and improve their interpersonal relationships by increasing their empathic ability and communication skills.

The second strongest predictor of phubbing was media multitasking motivation. The results of the present study are corroborated by a previous study reporting that the behavior of checking smartphone notifications in the presence of a companion or companions is a representative type of media mul-

titasking motivation, and that media multitasking motivation induces phubbing.[37] A common example of media multitasking is students' habitual and automatic use of smartphones in classrooms, which has been reported to lead to distractions, decreased attention, and phubbing.[38] Since media multitasking allows individuals to easily connect with others and engage in social exchanges, it has the advantage of facilitating the formation and maintenance of social relationships,[39] and it is helpful for enhancing learning in the e-learning era and for using and providing healthcare services.[36] However, several studies pointed out negative effects of media multitasking. In particular, media multitasking has been reported to hinder the processing of transmitted information, thereby decreasing the effects of media by reducing attention to messages and diminishing comprehension and recall[40] and hindering job performance.[41] Even though media multitasking is a common pattern of media consumption, since it acts as a predictor of phubbing, strategies for preventing media multitasking are required.

Smartphone addiction was found to be the third predictor of phubbing. In previous studies, smartphone addiction, SMS addiction, internet addiction, and game addiction were all shown to be predictors of phubbing.[33,36] Especially, the overuse of Instagram on smartphones was found to cause a higher level of phubbing.[42] Boredom, loneliness, and the so-called "fear of missing out" (FOMO) syndrome have been found to be associated

with phubbing. The FOMO syndrome and a lack of self-control predict both smartphone addiction and the level of phubbing.[33,36] These findings suggest that management of smartphone addiction of students is vitally important to prevent phubbing. If individuals excessively use social networks and specific games, they should change their habitual smartphone usage patterns and try to improve their self-control. Furthermore, college students should receive nuanced education on smartphone use, rather than simply advising against or restricting their phubbing, so that they can develop their self-regulatory capacity to appropriately control the use of mobile devices and reduce phubbing.

Significant differences were found in the level of phubbing by age, class standing, interpersonal relationships, and the time spent per day on the smartphone. The level of phubbing was higher in respondents under the age of 23, freshmen, respondents with poor interpersonal relationships, and those spending more than 10 hours per day on the smartphone. Sophomores showed the highest level of smartphone addiction. A higher level of smartphone addiction was also associated with a low level of major satisfaction and poor interpersonal relationships. The level of media multitasking motivation was higher in sophomores than in freshmen, and respondents with good interpersonal relationships showed a higher level of media multitasking motivation than those with poor interpersonal relationships. Males showed a higher level of interpersonal competency than females. Students with lower class standings showed a lower level of interpersonal competency, and seniors showed the highest level of interpersonal competency. Based on these results, educational programs to prevent phubbing should target students earlier in college (i.e., freshman and sophomores), and a preliminary survey of interpersonal relationships and daily smartphone usage time may help to establish phubbing prevention strategies.

Phubbing was negatively correlated with interpersonal competency, while it was positively correlated with smartphone addiction and media multitasking motivation. The observed relationship between phubbing and interpersonal competency is consistent with the findings of Al-Saggaf and O'Donnell.[43] Even having a smartphone at hand has been reported to reduce interpersonal closeness, connectedness, and trust.[44]

A higher level of smartphone addiction and a higher level of media multitasking were also associated with a greater degree of phubbing. Concentration on the smartphone during a conversation prevents individuals from paying attention to the conversation with their companion or companions, which may lead to phubbing. In a previous study, smartphone addiction was found to have a positive correlation with phubbing,[31] and based on this finding, it can be inferred that smartphone overuse causes a state of indifference to others and the loss of em-

pathy, which naturally leads to phubbing. Smartphone addiction has been reported to deteriorate the quality of interactions between two people and consequently damage face-to-face interactions.[44] Internet gaming disorder is classified as a type of addiction and attention is paid to its treatment. In contrast, smartphone addiction is not officially diagnosed as a medical condition, so it may not be recognized as a serious problem.[11] However, given concerns about the negative consequences of smartphone addiction, including phubbing, more attention should be paid to smartphone addiction among college students.

A significant correction was found between media multitasking motivation and phubbing, which is consistent with the results of Ames.[39] According to Ames,[39] media multitasking is caused by constant connection with others and competition for the level of connectedness, and multitasking acts as a cause of phubbing. Judd[45] claimed that greater use of SNS is related to increased media multitasking, which hinders face-to-face interactions. Therefore, further research on individual characteristics and personality traits of college students is required to reduce phubbing and media multitasking.

The negative correlation between smartphone addiction and interpersonal relationships is consistent with the previous finding that a higher level of smartphone addiction was associated with a lower level of interpersonal relationship and lower conversation intimacy.[46] Although smartphones are an efficient communication channel, excessive smartphone use may lead to missing or losing opportunities for other social relationships and in-person interactions, which may result in social isolation[47] and difficulties in adjustment. Therefore, smartphone users need to be wary of overdependence and be attentive to the proper use of smartphones.

The results of this study provide grounds for the implementation of interventions and educational programs to increase interpersonal competency and decrease media multitasking motivation and smartphone addiction as a strategy to reduce phubbing among nursing students. Individual and psychological factors also play an important role in the occurrence of phubbing, and the significance of these factors warrants further consideration. Although the present study of phubbing focused on variables related to digital media and interpersonal relationships, further research should consider other individual factors such as depression, anxiety, apprehension, and FOMO syndrome.

This study has several limitations. First, since data collection was conducted using a self-report questionnaire, the results may have been affected by social desirability bias and defense mechanisms. Therefore, qualitative research or observational research should be conducted to observe active and passive phubbing behaviors. Second, since smartphone addiction behaviors and digital multitasking are linked to phubbing, more comprehen-

sive research should consider additional psychological factors. Third, this study did not investigate perceptions of phubbers and phubbees or the impact of phubbing on family members, which are promising topics for future studies.

This study revealed that phubbing behaviors are widely prevalent in nursing students. The key message from our study were that nursing students need regular monitoring and appropriate control of their smartphone usage, and interpersonal competency is the core capacity to reduce their phubbing. This study helps to understand causes of phubbing, that may help nursing educators to explore treatment modalities and design interventions to reduce phubbing behavior.

In conclusion, this study examined the level of phubbing among nursing students and investigated the relationships among phubbing, smartphone addiction, media multitasking motivation, and interpersonal competency to identify factors affecting phubbing. To reduce phubbing, it is important to reduce smartphone addiction and media multitasking and improve interpersonal competency through education on the proper use of smartphones, programs to prevent smartphone addiction, and programs to improve interpersonal relationships. Since phubbing occurs frequently among nursing students, educators in nursing are required to develop and implement active interventional measures to help nursing students avoid phubbing and improve their interpersonal relationships by increasing their empathic ability and communication skills.

Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

Author Contributions

Conceptualization: Youngji Kim, Jung Hee Han. Data curation: Su-Jin Park, Jung Hee Han. Formal analysis: Su-Jin Park, Jung Hee Han. Funding acquisition: Youngji Kim. Writing—original draft: Youngji Kim, Jung Hee Han. Writing—review & editing: Youngji Kim, Jung Hee Han. All authors critically reviewed and approved the manuscript.

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