Factors Associated with Musculoskeletal Pain and Fatigue during Online Learning among Nursing Students

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Abstract: Since the COVID-19 pandemic, nursing education has shifted to more online learning. This shift may cause some problems with musculoskeletal pain and fatigue. This cross-sectional study investigated the prevalence of musculoskeletal pain, fatigue, and associated factors from online learning among 234 nursing students in Bangkok, with data collected from January to March 2023. The instruments used were the Personal Data Sheet, the Health Status Form, the Online Learning Risk Assessment, the Single-Item Visual Analogue Scale for Fatigue, and the Nordic Musculoskeletal Questionnaire. Data were analyzed using a chi-square test, t-test, and logistic regression.

Of the 234 participants, 222 (94.9%) were women, averaging 20.6 ± 1.3 years. They spent an average of 7.5 hours per day on online learning, with 87.6% sitting in chairs without armrests and backrests. Additionally, 86.3% spent over three hours online daily, 61.5% using tablets without separate keyboards as their main device, and 33.3% using mobile phones. Over the past six months, 80.8% of participants experienced musculoskeletal pain, and 79.9% experienced moderate to severe fatigue. Sitting with the head down for over 2 hours daily was the strongest predictor for musculoskeletal pain, while sitting in the same spot for over two hours predicted fatigue. During online learning, musculoskeletal pain and fatigue can be prevented through targeted interventions that encourage regular breaks to reduce prolonged sitting and ergonomic adjustments for healthier sitting posture. The study recommends adding ergonomic and self-care education to nursing curricula to prevent discomfort from prolonged sitting and poor posture, especially in online learning.

Keywords: Fatigue, Musculoskeletal pain, Nursing students, Online learning

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Background

The educational environment has rapidly evolved, transitioning from conventional in-person teaching to a hybrid learning approach due to the impact of the COVID-19 pandemic. The widespread acceptance of online learning platforms such as Zoom, WebEx, and Microsoft Teams extends to various academic disciplines, including nursing education. Online learning offers flexibility and convenience, allowing students to access educational materials and engage in coursework remotely.[1-2] However, this shift to online learning modalities may also lead to unintended consequences, particularly musculoskeletal pain, such as neck, shoulder, and back pain, and fatigue among nursing students. This underscores the urgent

need for further research and interventions to address these issues.[3-4]

Musculoskeletal pain (MSP) refers to the sensation of pain experienced in many anatomical areas, including muscles, tendons, ligaments, nerves, bones, and joints.[5] Injuries can happen suddenly or develop gradually due to ergonomic factors. Extreme posture can stress joints and block blood flow, while the excessive force from activities like pulling or lifting increases strain on joints and connective tissues, leading to MSP and fatigue. Poor conditions like excessive force, prolonged periods of inactivity, repetitive movements, and an uncomfortable posture contribute to MSP and pain.[6-7] Personal factors like age, medical conditions (i.e., diabetes, rheumatoid arthritis), weight, height, gender, and physical activity levels are linked to musculoskeletal pain.[7-9] Women are more affected than men, and older adults experience more issues due to cartilage loss, reduced strength, decreased ligament elasticity, increased bone fragility, and fat redistribution, which impair tissue function.[7,10] In addition to personal factors, the use of electronic devices, prolonged periods of sitting, and bent posture have contributed to MSP.[11] Persistent pain can lead to decreased concentration, decreased productivity, and increased absenteeism.[5,12] Consequently, this pain significantly increases compensation costs, as well as medical expenses and healthcare needs related to injuries and illnesses.[13]

Online learning fatigue refers to the physical, mental, and emotional exhaustion a person experiences due to prolonged engagement in online learning activities.[13-14] Participating in online activities requires more focus and energy than face-to-face interactions.[15] This is because individuals must concentrate not only on learning tasks but also on body language, nonverbal cues, and facial expressions, which can lead to fatigue.[15] Notably, over half of students (64.97%) report experiencing fatigue during online learning, negatively impacting their academic performance, motivation, stress levels, and burnout.[18-19] Like undergraduate nursing students, 52.2% reported feeling fatigued during online learning,[16] which involved online activities such as lectures, discussions, webinars, virtual simulations, quizzes, accessing electronic resources, and other interactive tasks.[11] The need to spend long hours on online activities can create a vicious cycle that restricts daily physical activities, resulting in both musculoskeletal pain and fatigue.[17] Therefore, it is crucial for healthcare educators and institutions to identify the factors contributing to musculoskeletal pain and fatigue in nursing students during online learning. This insight can inform targeted interventions to alleviate these issues. In addition, understanding these factors can spur further research on online learning, which may lead to evidence-based recommendations for curriculum design, ergonomics, and student support services.

Conceptual Framework

This study was guided by the concept of physical ergonomics and a literature review. Physical ergonomics emphasizes the interaction between individuals and their environments, especially the tools and conditions they use, to enhance performance and minimize physical strain.[18] The concept highlights how poor ergonomic conditions, such as improper posture, unsuitable workstations, inadequately illuminated workspaces, and prolonged device use, can lead to MSP and fatigue.[15,19] An ergonomic setup is crucial for maintaining physical health comfort in online learning, particularly for nursing students who use various electronic devices for different online activities.

Study Aims

The aims of this study were 1) to investigate the prevalence of musculoskeletal pain and fatigue and 2) to determine whether poor ergonomic conditions and personal factors were associated with musculoskeletal pain and fatigue among undergraduate nursing students at a university in Bangkok, Thailand, during online learning.

Methods

Study Design: This study used a cross-sectional design. This report followed the STROBE Statement—Checklist of items of cross-sectional studies.

Sample and Setting: The study targeted 240 undergraduate nursing students from a university in Bangkok, covering academic years one to four. The inclusion criteria included males and females aged 18 to 25, enrolled in the nursing program for at least six months, experienced with online learning platforms, and willing to participate. The exclusion criteria were pregnant students or those who had given birth within the past year, students with a medical history of kidney disease, spinal deformities, gout, rheumatoid arthritis, or those who had undergone back surgery. The sample was calculated based on the finite population formula.[20] With a population size (N) of 902, an estimated proportion of musculoskeletal pain among students (p) of 0.75, a desired precision level (d) of 0.05, and a z-value of 1.96 for a 95% confidence level.[21] The minimum required sample size was calculated to be 219 individuals. A target non-response rate of 10% was set to address potential non-response, resulting in a final sample size of 240 participants. The convenience sampling method was used to recruit participants.

Ethical Considerations: This research was approved by the Human Research Ethics Committee of the Faculty of Medicine Ramathibodi Hospital, Mahidol University, with approval number COA.MURA2022/445, valid from August 3, 2022 to August 2, 2023. After receiving approval, the principal investigator (PI) invited participants to a Zoom meeting. During the meeting, the PI outlined the objectives, method, instruments, confidentiality management, and participants' rights. They were assured that their participation would not impact their grades or have any academic consequences, and they could withdraw from the study at any time. Participants were informed during the meeting that their data would be kept confidential and used solely for research purposes, and this was also noted in the information sheet. All data would be permanently deleted by overwriting data (writing a set pattern of the existing data) to ensure participants' privacy.

Instruments: This study used five online-administered questionnaires created through Microsoft Forms with permission from the original authors. The reliability of the questionnaires was tested among 30 convenient participants who met the same criteria and had characteristics similar to those of the study participants.

The Personal Data Sheet was developed by the PI to obtain the participants' age and gender.

The Health Status Form was used to collect data about weight and height, and history of injuries and illnesses.

The Online Learning Risk Assessment was developed by the PI to examine hours spent working online, types of computers and mobile devices used, and usage frequency each semester. The instrument also gathered data on sitting behaviors, including breaks during sitting, sitting postures, desk and chair types, and lighting adequacy.

The Single-Item Visual Analogue Scale (VAS) for Fatigue was developed based on the pain VAS concept by Scott and Huskisson in 1976. While it does not have a specific developer, it is widely used in clinical and research settings to measure fatigue levels. In this study, the single-item VAS for fatigue in Thai was used to assess students' fatigue levels, ranging from 0 (no fatigue at all) to 10 (extreme fatigue).[22] The test-retest reliability of the VAS used over 30 minutes was 0.87 in the pilot study. A 30-minute interval reduces memory issues, ensuring any changes in fatigue ratings reflect actual symptoms, not recall errors. The VAS was a single-item scale that ranged from 0 (indicating no fatigue at all) to 10 (indicating extreme fatigue). Fatigue levels were categorized as follows: no fatigue (score of 0), mild fatigue (score of 1-3), moderate fatigue (score of 4-6), and severe fatigue (score of 7-10). Participants in this study were then divided into two groups based on their fatigue levels: 1) no fatigue (score of 0-3) and 2) fatigue (score of 4 and above).

The Nordic Musculoskeletal Questionnaire (NMQ) was developed by Kuorinka et al.[23] to assess MSP in nine different regions such as neck, shoulder, elbows, hand/wrist, upper back, lower back, buttocks/hip/thighs, knees, and feet/ankles in the previous 7 days and 12 months.[23] The tool has been previously used to evaluate the prevalence of MSP among Thai university students.[11] In this study, four additional body regions, such as the fingers, forearm, upper arm and lower leg, were also assessed for MSP prevalence. Participants were asked to report any MSP experienced in the specified body regions over the past six months. The tool is reliable and trustworthy for monitoring musculoskeletal issues and assessing exposure. It consists of three sections: The first section asked participants if they had experienced any ache, pain, or discomfort in the past six months, with a response of "no" or "yes" for at least one area; the second asked them to specify affected areas, such as the neck, shoulder, upper arm, elbow, forearm, hand/wrist, upper and lower back, hip/thigh, knee, calf, and foot/ankle. In the third section, participants rated their pain on a numerical rating scale (NRS) from 1 (least pain) to 10 (most severe pain). The original questionnaire was in English and was translated into the Thai language in 2006.[24] The questionnaire content validity was tested by five experts, at 0.92.[24] The intra-rater reliability was 0.98.[25]

Data Collection: After obtaining ethical approval, a Zoom link was shared with nursing students to invite them to learn more about the research project. Attendance was voluntary. During the meeting, only the PI, who is not a faculty member, explained the Participant Information Sheet, outlined participants' rights and the option to withdraw at any time without penalty, and clarified that the project was not affiliated with the nursing school and would not affect their grades. The PI also addressed any questions from participants.

A link and QR code were displayed on the screen, and participants were informed that they could access the Information Sheet. They could choose to consent either immediately or later, and their decision would remain anonymous. Participants who consented were directed to questionnaires that took about 15-20 minutes to complete, while those who did not consent were redirected away from the questionnaire. The data collection was conducted between January and March 2023. All collected responses were securely stored on encrypted servers, with access limited to the PI. Identifying information was removed from the dataset to maintain anonymity.

Data Analysis: Analysis was performed using the STATA software package, version 16.1. Descriptive statistics were performed to obtain the frequencies, means, and standard deviation. A test of normality was conducted for the continuous variable. This study examined two dependent variables: MSP experienced in the past six months and the level of fatigue during the same period. The chi-square test was used to investigate bivariate association. The t-tests were employed to investigate the correlation between quantitative independent and dependent variables.

Univariate logistic regression analysis was used to explore the relationship between a single independent variable and the level of pain and fatigue. Multiple logistic regression was performed to determine whether ergonomic and personal factors were associated with MSP and fatigue. The significance level (α) was set at 0.05 for all statistical tests. The assumptions of the chi-square and binary logistic regression analyses were carefully examined.

Results

The initial group included 240 nursing students, with 234 meeting the inclusion criteria. The average age was 20.6 (SD = 1.3), and 94.9% were female. The average BMI was 21.3 (SD = 3.5). Participants spent an average of 7.5 hours per day (SD = 2.6) on online learning, with 86.3% studying for three hours or more and 45.5% taking breaks 1-2 times a day. The primary devices used were tablets without a separate keyboard (61.5%) and mobile phones (33.3%). Additionally, 87.6% used chairs without armrests and backrests, 84.6% sat with their heads down for over two hours daily, 50.9% sat twisted for more than three hours, and 83.8% sat in the same spot for over two hours (**Table 1**).

Table 1. Characteristics of study participants (n = 234)

Characteristics	Subcategory	n (%)
Gender	Male	12 (5.1%)
	Female	222 (94.9%)
Age (year), mean ± SD		20.6 ± 1.3
(min-max)		(18-25)
Body mass index, mean ± SD		21.3 ± 3.5
(min-max)		(15.4-35.6)
Online learning hours per day, mean ± SD		7.5 ± 2.6
(min-max)		(2.0-16.0)
Online learning hours	Less than 3 hours	32 (13.7%)
	3 hours or more	202 (86.3%)
Total breaks per day (n = 202)*	Not taking any breaks	12 (5.9%)
	Taking breaks 1-2 times a day	92 (45.5%)
	Taking breaks 3-4 times a day	78 (38.6%)
	Taking breaks 5 times a day or more	20 (9.9%)
Electronic devices for online learning	Mobile phone	78 (33.3%)
	Note book/Personal computer	5 (2.1%)
	Tablet with a separate keyboard	7 (3.0%)
	Tablet without a separate keyboard	144 (61.5%)
Illuminated workspace	Inadequate	39 (16.7%)
	Adequate	195 (83.3%)
Type of desk chair	With armrest and backrest	29 (12.4%)
	Without armrest and backrest	205 (87.6%)
Type of work desk	Appropriate	98 (41.9%)
	Inappropriate	136 (58.1%)
Sitting posture		
Sitting with head down for more than	No	36 (15.4%)
2 hours a day consecutively	Yes	198 (84.6%)
Sitting with body twisted for more than	No	115 (49.1%)
3 hours a day consecutively	Yes	119 (50.9%)
Sitting in the same spot for more than	No	38 (16.2%)
2 hours a day consecutively	Yes	196 (83.8%)
Academic workload	Low	1 (0.4%)
	Excessive	176 (75.2%)
	Appropriate	57 (24.4%)

Note. * missing 32 cases

Approximately 80.8% of participants experienced musculoskeletal pain in the past six months, mainly in the neck, shoulders, and back. The average pain score was 5.26 (SD = 2.9), predominantly severe (41.0%) and moderate (34.6%). In terms of fatigue, nearly half (46.6%) reported severe fatigue, while less than a quarter (14.5%) reported mild (**Table 2**).

Table 2. The prevalence rate of musculoskeletal pain and fatigue level over a 6-month period (n = 234)

Characteristics	Subcategory	n (%)
Musculoskeletal pain over the past 6 months	No	45 (19.2%)
	Yes	189 (80.8%)
Musculoskeletal pain location*	Neck	139 (59.4%)
	Shoulder	124 (53.0%)
	Back	136 (58.1%)
	Arm/ Elbow	34 (14.5%)
	Hand/ Wrist	43 (18.4%)
	Hip/Thigh	32 (13.7%)
	Knee	27 (11.5%)
	Calf	49 (20.9%)
	Foot/ Ankle	50 (21.4%)
Pain score, mean ± SD (min-max) Musculoskeletal pain level		5.26 ± 2.9 (0-10)
	No (score 0)	45 (19.2%)
	Mild (score 1-3)	12 (5.1%)
	Moderate (score 4-6)	81 (34.6%)
	Severe (score 7-10)	96 (41.0%)
Fatigue level		
	No (score 0)	13 (5.6%)
	Mild (score 1-3)	34 (14.5%)
	Moderate (score 4-6)	78 (33.3%)
	Severe (score 7-10)	109 (46.6%)

Note. * One participant might have more than one pain location.

A chi-square analysis revealed that gender, sitting with participants' heads down for more than 2 hours a day, sitting with participants' bodies twisted for more than 2 hours a day, and sitting in the same spot for more than 2 hours a day consecutively were significantly associated with musculoskeletal pain levels at the significance level of 0.05 ($p = 0.044$, $p = 0.009$, $p = 0.035$, and $p = 0.050$, respectively) **(Table 3).**

Table 3. Factors related to musculoskeletal pain during online learning (n = 234)

Factors	Musculoskeletal pain		p-value
	Moderate-Severe	Normal-Mild	
	n = 177 (75.6%)	n = 57 (24.4%)	
Age (years), mean ± SD	20.7 ± 1.2	20.4 ± 1.4	0.128[a]
BMI [weight/(height) m^2], mean ± SD	21.4 ± 3.5	20.8 ± 3.3	0.247[a]
Gender (% Female)	171 (96.6%)	51 (89.5%)	0.044[b]
Sitting while studying for 3 hours or more a day	157 (88.7%)	45 (78.9%)	0.062[b]
Inadequately illuminated workspace	32 (18.1%)	7 (12.3%)	0.307[b]
Usual chair lacks back and arm support	155 (87.6%)	50 (87.7%)	0.976[b]
Work desk lacks suitable dimensions for effective use	77 (43.5%)	21 (36.8%)	0.375[b]
Sitting with head down for more than 2 hours a day consecutively	156 (88.1%)	42 (73.7%)	0.009[b]
Sitting with body twisted for more than 2 hours a day consecutively	97 (54.8%)	22 (38.6%)	0.035[b]
Sitting in the same spot for more than 2 hours a day consecutively	153 (86.4%)	43 (75.4%)	0.050[b]

Note. [a] t-test, [b] chi-square, BMI = body mass index

Multiple logistic regression analyses (**Table 4**) showed that only sitting with the participants' heads down for more than 2 hours a day consecutively was significantly ($p < 0.05$) associated with the musculoskeletal pain level. Participants who sat head down for more than 2 hours a day consecutively were 2.65 times more likely to experience musculoskeletal pain compared to those who did not adopt this position. The model explained 75.6% (Nagelkerke R^2) of the variance in musculoskeletal pain during online learning. The equation for logistic regression was as follows: Logit (P) = 0.366 + 2.653 (Sitting with participants' heads down for more than 2 hours a day consecutively) **(Table 4).**

Table 4. Predictors of musculoskeletal pain during online learning (n = 234)

Factors	Univariate		Multivariate	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Gender	3.353 (1.036-10.846)	0.043		
Sitting with body twisted for more than 2 hours a day consecutively	1.929 (1.048-3.550)	0.035		
Sitting in the same place for more than 2 hours a day consecutively	2.076 (0.989-4.354)	0.053		
Sitting with head down for more than 2 hours a day consecutively	2.653 (1.259-5.589)	0.009	2.653 (1.259-5.589)	0.01
Constant 0.336				

Note. Predicted percent = 75.6%, Wald chi-square of model fit = 6.588, p = 0.01

Regarding fatigue, a chi-square analysis indicated that sitting for 3 hours or more a day, sitting with the participants' heads down for more than 2 hours a day consecutively, and sitting in the same spot for more than 2 hours a day consecutively were significantly associated with the fatigue levels during the online learning at the significance level of 0.05 ($p = 0.030$, $p = 0.009$, $p = 0.005$, respectively) **(Table 5).** Other independent variables [i.e., age, gender, body mass index (BMI), inadequately illuminated space, chair lacking backrest and armrest, an unsuitable work desk, and sitting with twisted bodies for over 2 hours a day consecutively] had no statistically significant relationship with fatigue **(Table 5).**

Table 5. Factors related to fatigue during online learning (n = 234)

Factors	Fatigue level		p-value
	Moderate-Severe n = 187 (79.91%)	No -Mild n = 47 (20.09%)	
Age (years), mean ± SD	20.7 ± 1.2	20.5 ± 1.5	0.407[a]
BMI [weight/(height) m^2], mean ± SD	21.4 ± 3.5	20.8 ± 2.7	0.307[a]
Gender (% Female)	177 (94.7%)	45 (95.7%)	1.000[b]
Sitting while studying for 3 hours or more a day	166 (88.8%)	36 (76.6%)	0.030[b]
Inadequate illuminated workspace	34 (18.2%)	5 (10.6%)	0.215[b]
Desk chair without backrest and armrest	163 (87.2%)	42 (89.4%)	0.683[b]
Unsuitable work desk	82 (43.9%)	16 (34.0%)	0.223[b]
Sitting with head down for more than 2 hours a day consecutively	164 (87.7%)	34 (72.3%)	0.009[b]
Sitting with body twisted for more than 2 hours a day consecutively	100 (53.5%)	19 (40.4%)	0.110[b]
Sitting in the same spot for more than 2 hours a day consecutively	163 (87.2%)	33 (70.2%)	0.005[b]

Note. [a] t-test, [b] chi-square, BMI = body mass index

Multivariate logistic regression was employed to examine the predictors of fatigue during online learning. The findings indicated a significant association ($p < 0.05$) between fatigue levels and consecutively sitting in the same spot for more than 2 hours a day. Specifically, the odds ratio (OR) for experiencing fatigue increased by 2.88 times in such cases. The predictive model accurately predicted fatigue during online learning with an accuracy rate of 79.9%. The logistic regression equation was expressed as Logit (P) = 0.539 + 2.881 (Sitting in the same place for more than 2 hours a day consecutively) **(Table 6).**

Table 6. Predictors of fatigue during online learning (n = 234)

Factors	Univariate		Multivariate	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Siting while studying for 3 hours or more a day	2.415 (1.071 - 5.449)	0.034		
Sitting with head down for more than 2 hours a day consecutively	2.726 (1.257 - 5.911)	0.011		
Sitting in the same spot for more than 2 hours a day consecutively	2.881 (1.350 - 6.148)	0.006	2.881 (1.350 - 6.148)	0.006
constant = 0.539				

Predicted percent = 79.9 %, Wald chi-square of model fit = 7.489, p = 0.006

Discussion

This study found that sitting with heads down for more than two hours daily was the strongest predictor of musculoskeletal pain while sitting in the same spot for over two hours was the strongest predictor of fatigue.

Our findings showed that 80.8% of nursing students reported experiencing musculoskeletal pain related to online learning over the past six months. Our findings are consistent with earlier studies showing that over half of nursing students in Nepal (82.4%) and university students in Poland (74.6%) reported experiencing musculoskeletal pain.[26-27] These studies were conducted after the COVID-19 pandemic, during which these institutions provide online or hybrid classes, requiring students to spend more time using laptops, tablets, and mobile phone for both academic and leisure activities.[28-29] In addition, dental and physiotherapy students have shown to have high prevalence of musculoskeletal pain.[30-31] In contrast, previous studies found that less than half of university students (42.1%) experienced musculoskeletal pain particularly neck and back areas. A discrepancy finding may be associated with the measurement tools and study populations.

The causes of MSP are linked to interpersonal and ergonomic factors.[5,27,29] In terms of personal factors, our findings indicated that female nursing students reported more pain than their male peers. This finding is consistent with previous research that identified MSP among female students in distance education during the COVID-19 pandemic.[32] It is important to note that females are more likely to develop MSP due to lower muscle mass and bone density, which increases their vulnerability to musculoskeletal issues.[32-33] However, BMI has not been significantly linked to MSP over the past six months. This finding aligns with earlier studies among undergraduate nursing students and professional workers,[11,34] where participants generally had normal BMI levels, and no association with MSP was found. In contrast, our results differ from a previous study that identified a connection between BMI and MSP

in patients with obesity and metabolic diseases.[35] Regarding ergonomic factors, our finding showed that sitting three or more hours a day was not associated with MSP. This aligns with previous studies that found no significant relationship between using smartphones or computers for over four hours and MSP.[36] However, complaints of MSP were more common among those who used smartphones for more than four hours a day.[37] Therefore, prolonged sitting and using electronic devices for over four consecutive hours should be a concern. On the other hand, participants who sat with their bodies twisted for more than two consecutive hours a day were significantly associated with MSP. This aligns with a prior study showing a link between twisted sitting position and MSP among guitar players.[38] Additionally, our study found that participants who had heads down for over two consecutive hours a day were 2.65 times more likely to develop MSP. Our result is consistent with a study among high school students, which also showed that sitting posture is linked to MSP.[39] These results highlight the need for awareness in online learning environments, as poor posture can negatively affect muscle shape, deform the skeleton, and lead to abnormal development, ultimately impacting posture maintenance.[40]

Regarding fatigue, 79.9% of nursing students experienced moderate to severe fatigue during online learning. Our findings align with previous studies showing that 90.5% of Indonesian university students experience moderate to severe fatigue during online activities,[41] and 46.67% reported moderate fatigue during Zoom online learning.[42] The variation in fatigue prevalence warrants caution due to the differences in methodologies, instruments, sampling techniques, and data collection methods. Another finding from our study is that sitting in the same spot for over two consecutive hours predicted fatigue among nursing students. This notion aligns with previous research indicating that more hours spent in front of electronic devices is linked to increased fatigue.[43] Similarly, a study among nursing students in Poland found that time spent on computers was associated with both fatigue and overall physical health.[44] Similar findings are found among medical students and physicians who reported moderate to high fatigue.[45] Therefore, ergonomic adjustments, such as tools designed to promote proper posture and reduce the effects of repetitive movements, should be monitored to improve posture and decrease fatigue during prolonged sitting.

This study provides new insights into the factors contributing to MSP and fatigue during online learning among nursing students. Given the consequences of MSP and fatigue, it is essential to implement effective teaching methods, appropriate hours, institutional support, and resources to prevent these issues.

Limitations

The current study's limitation was that it focused only on nursing students, which limited the generalizability of the findings. The cross-sectional study prevented the determination of any causal relationship between the risk factors of MSP and fatigue experienced during online learning. Furthermore, using self-reporting via questionnaires introduced the possibility of recall bias.

Conclusions and Implications

This study highlights that online learning is associated with a high risk of MSP and fatigue among Thai nursing undergraduates. Musculoskeletal pain was common, with extended periods of sitting with the head down identified as a significant predictor. Fatigue levels were also high, with prolonged sitting being a key factor. Since these risks are preventable, recommendations include promoting regular breaks and ergonomic adjustments to improve sitting posture during online learning. Nursing institutions should consider reconfiguring digital educational settings to incorporate ergonomic evaluations and offer virtual meetings with ergonomic experts. Furthermore, policies

to support regular breaks and movement during long study sessions should be considered.

Future research should consider conducting longitudinal studies to assess the long-term effects of ergonomic interventions on musculoskeletal health and fatigue in students. Findings highlight the need for ergonomic improvements in clinical settings, promoting healthy posture and regular breaks to prevent physical strain. Our study suggests integrating ergonomic and self-care education into nursing curricula to help students prevent discomfort from prolonged sitting and poor posture, especially during online learning.

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ปัจจัยที่สัมพันธ์กับอาการปวดกล้ามเนื้อและความอ่อนล้าระหว่างการเรียนแบบออนไลน์ในนักศึกษาพยาบาล

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บทคัดย่อ: สถานการณ์การระบาดของโควิด-19 ส่งผลให้รูปแบบการเรียนการสอนทางการพยาบาลได้ปรับเปลี่ยนไปสู่การเรียนแบบออนไลน์มากขึ้น ซึ่งอาจก่อให้เกิดปัญหาเกี่ยวกับอาการปวดกล้ามเนื้อและความอ่อนล้า การศึกษาภาคตัดขวางนี้ มีวัตถุประสงค์เพื่อสำรวจความชุกของอาการปวดกล้ามเนื้อ ความอ่อนล้า และปัจจัยที่เกี่ยวข้องจากการเรียนแบบออนไลน์ ในนักศึกษาพยาบาลระดับปริญญาตรี 234 คน ที่ศึกษาในมหาวิทยาลัยแห่งหนึ่งในกรุงเทพมหานคร ประเทศไทย เก็บข้อมูลระหว่างเดือนมกราคมถึงมีนาคม พ.ศ. 2566 เครื่องมือที่ใช้ประกอบด้วยแบบสอบถามปัจจัยส่วนบุคคลและสถานะสุขภาพ การประเมินความเสี่ยงจากการเรียนแบบออนไลน์แบบประเมินระดับความอ่อนล้าด้วยภาพเส้นตรง และแบบสอบถามระบบกล้ามเนื้อและโครงกระดูกนอร์ดิก ใช้การวิเคราะห์ข้อมูลด้วยวิธีไคสแควร์ การทดสอบที และการถดถอยโลจิสติก

จากกลุ่มตัวอย่างจำนวน 234 ราย เป็นเพศหญิง 222 ราย (ร้อยละ 94.9) อายุเฉลี่ย 20.6 ± 1.3 ปี และใช้เวลาเรียนแบบออนไลน์เฉลี่ย 7.5 ชั่วโมงต่อวัน โดยนั่งบนเก้าอี้ที่ไม่มีที่พักแขนและพนักพิงร้อยละ 87.6 ใช้เวลาเรียนออนไลน์สามชั่วโมงขึ้นไปต่อวันร้อยละ 86.3 ใช้แท็บเล็ตที่ไม่มีคีย์บอร์ดแยกเป็นอุปกรณ์หลักในการเรียน ร้อยละ 61.5 และใช้โทรศัพท์มือถือร้อยละ 33.3 ในช่วงหกเดือนที่ผ่านมา กลุ่มตัวอย่างมีอาการปวดกล้ามเนื้อร้อยละ 80.8 และพบว่ามีอาการอ่อนล้าระดับปานกลางถึงรุนแรงร้อยละ 79.9 การนั่งก้มศีรษะเป็นเวลามากกว่าสองชั่วโมงต่อวันเป็นปัจจัยทำนายที่แข็งแกร่งที่สุดสำหรับอาการปวดกล้ามเนื้อ ในขณะที่การนั่งในตำแหน่งเดิมนานเกินสองชั่วโมงเป็นปัจจัยทำนายความอ่อนล้า อาการปวดกล้ามเนื้อและความอ่อนล้าในระหว่างการเรียนแบบออนไลน์ สามารถป้องกันได้ด้วยการส่งเสริมให้มีการหยุดพักเป็นระยะเพื่อลดการนั่งนานและปรับทางการยศาสตร์ให้ได้ท่าทางการนั่งที่ดีต่อสุขภาพมากขึ้น การศึกษานี้แนะนำให้เพิ่มเนื้อหาเกี่ยวกับการยศาสตร์และการดูแลตนเองในหลักสูตรพยาบาลศาสตร์ เพื่อป้องกันอาการไม่สุขสบายจากการนั่งเป็นเวลานาน รวมถึงลักษณะท่าทางในการนั่งที่ไม่เหมาะสม โดยเฉพาะอย่างยิ่งในการเรียนแบบออนไลน์

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คำสำคัญ: ความอ่อนล้า อาการปวดกล้ามเนื้อ นักศึกษาพยาบาล การเรียนแบบออนไลน์

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