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Original Article

Prevalence and factors affecting work-related musculoskeletal disorders among faculty members at Northeastern Universities in Thailand

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ABSTRACT

Introduction: Work-related musculoskeletal disorders (WMSDs) are a leading cause of disability globally. In Thailand, WMSD incidence is high among people in several occupations. University faculty members who regularly use computers for long hours are an at-risk group. The aim of study is to determine prevalence and risk factors of WMSD for targeted interventions.

Methods: This cross-sectional analytical study collected data online via Google Forms from 640 university faculty members between November 2023 and March 2024 and analyzed them using a General Linear Mixed Model (GLMM).

Results: This study revealed a 58.9% prevalence of severe and very severe WMSDs in the neck, shoulders, and upper back. Significant risk factors of WMDs ($p<0.001$) included gender, stress, poor posture, and use of non-ergonomic workstations. Women were at 1.94 times greater risk of WMSDs than men. Those with severe stress were 4.80 times more likely to experience WMSDs than people with moderate stress. Faculty with inappropriate postures had a 2.67 times higher risk of WMSDs, and non-ergonomic workstations increased WMSD likelihood by 1.65 times.

Conclusion: The prevalence of severe and very severe WMSDs was almost high, and four factors that contribute to WMSDs among university faculty members are gender, severe stress, poor posture, and use of non-ergonomic workstations. Faculty should be made aware of the high prevalence of WMSDs, take preventative measures in stress management, and use appropriate postures. Universities should provide ergonomic workstations and educate faculty on the risk factors associated with WMSD.

Keywords: Appropriate posture, Ergonomic workstation, Inappropriate posture, University faculty members, Work-related musculoskeletal disorders (WMSDs).

Introduction

The Global Burden of Disease Study 2019 indicated that about 1.71 billion people experience musculoskeletal disorders (MSDs), making this a leading cause of disability and the highest need for rehabilitation.[1] This aligns with the findings from the Secular Trends in Musculoskeletal Rehabilitation Needs in 191 Countries and Territories study. The study reported a 61% global increase in MSD-related rehabilitation cases from 1990 to 2019, from 1,060.6 to 1,713.6 million

instances.[2] Work is a primary factor contributing to the development of MSDs. Although data specifically distinguishing work-related musculoskeletal disorders (WMSDs) from non-work-related MSDs is limited, numerous studies highlight their high prevalence. The data collected from 2016 to 2022 in Thailand by the Workmen's Compensation Fund Office showed that WMSDs were consistently ranked as the leading work-related physical impairment.[3] A systematic review of 13 studies involving 4,632 information technology professionals worldwide reported WMSD incidence rates ranging from 20 to 89%.[4] The overall prevalence rate of WMSDs was 71.9% among office workers in Higher Education Institutions (HEIs).[5] The meta-analysis revealed that the overall prevalence of MSDs among teachers is 68% in 44 studies, involving 15,972 teachers.[6] Discomfort was most commonly reported in the neck, shoulder, and upper back or upper limbs.[7,8] In Thailand, occupation-specific studies revealed high WMSD prevalence, 81.9% among hospital cleaners,[9] 89.3% among office workers,[10] and 91.7% among registered nurses.[11] Factors affecting WMSDs include repetitive movements, prolonged static postures, and use of non-ergonomic workstations.[12,13] Work stress and the lack of exercise were also contributing factors.[14,15,16,17] University faculty members are at risk due to prolonged computer use in a static posture. The current study examines the prevalence and factors correlated affecting the development of WMSDs of the neck, shoulders, and upper back according to three positions exhibit the highest prevalence of musculoskeletal disorders among Thai university faculty members in the northeastern region of the country who regularly use computers. The findings of this study will be useful for developing targeted interventions.

Methods

This is a cross-sectional analytical research study with 640 participants. The sample size was calculated according to Hsieh FY at a 95% confidence interval (CI) and 80% test power.[18] The formula was adjusted to account for correlations between variables ($\varrho = 0.65$), multicollinearity (VIF = 2.86), and an expected 25% non-response rate.

The data collection was conducted over five months (November 2023 to March 2024). The study participants were university faculty members from 13 northeastern universities in Thailand who met the following criteria: they were 18 years or older, had been in their current position for at least six months, regularly used computers for at least four hours a day–four days a week, could read and write in Thai, were willing to participate, could complete the online questionnaire, and had no history of musculoskeletal disorders requiring surgery or diagnoses of gout, osteoarthritis, rheumatoid arthritis, or osteoporosis. A multi-stage sampling using cluster and proportional methods was employed. The process began with cluster sampling, followed by the random selection of provinces and stratified sampling of universities. Universities were then categorized proportionally by size, and simple random sampling was ultimately applied to obtain the required sample size.

Data for this study were collected through a self-administered online questionnaire via Google Forms. The questionnaire collected demographic information, stress assessment using the Suan Prung Stress Test (SPST-20),[19] depression evaluation with the 9Q Depression Questionnaire,[20] and MSDs prevalence and severity assessment using a Modified Nordic Questionnaire.[21,22] Additionally, workstation ergonomics were evaluated using questions adapted from the Rapid Office Strain Assessment (ROSA).[23] A workstation was classified as ergonomic if it met at least eight of nine specified criteria; otherwise, it was considered non-ergonomic. When considering work-related musculoskeletal disorders (WMSDs), participants were categorized as non-affected if they reported no, mild, or moderate symptoms, while those with severe or very severe symptoms were classified as affected. This study focuses exclusively on MSD

responses related to the neck, shoulders, and upper back. STATA software version 10.1 was used for statistical analysis. Descriptive statistics were calculated for all factors. Bivariate analysis using simple logistic regression was performed to assess the correlation between WMSDs and each independent variable without accounting for the effects of other variables. Those variables with a p-value less than 0.25 at a 95% confidence interval (CI) were selected for further analysis. Multiple logistic regression, using a Generalized Linear Mixed Model (GLMM), was then employed to determine the relationships between the dependent variable and selected independent variables. A stepwise backward selection process was used to identify significant predictors, with a threshold p-value ≤0.05 and a 95% CI. This study was conducted in accordance with the Helsinki Declaration and the principles of Good Clinical Practice (GCP). The protocol was reviewed and approved by the Human Research Ethics Committee of Khon Kaen University (Approval Number HE662199, dated November 3, 2023).

Results

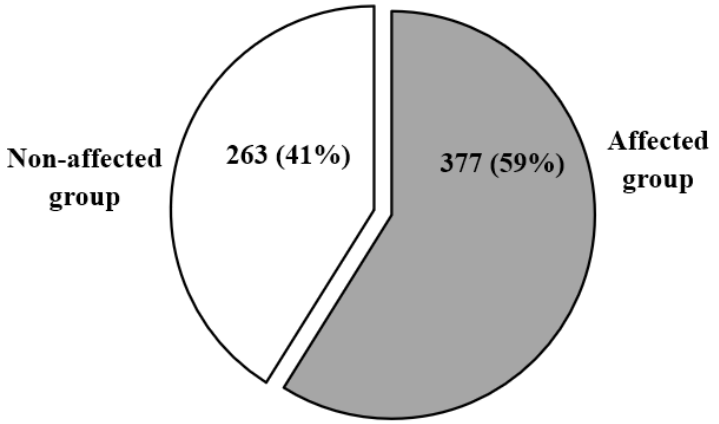
The study sample group consisted of 409 females (63.9%) and 231 males (36.1%) with an average age of 44.3±7.7 years. Most participants reported moderate stress (287, 44.9%), followed by high stress (224, 35.0%) and severe stress (75, 11.7%). More than half of the participants (376, 58.7%) indicated inappropriate work postures. An assessment revealed that (472, 73.7%) of the participants had non-ergonomic workstations. Appendix 1 presents data on the demographic, physical, psychological, work characteristics, and workstation factors, totaling 23 variables. Appendix 2 shows the results of the bivariate analysis. Fourteen factors were significantly correlated with WMSDs in the neck, shoulders, and upper back at p-values <0.25 and a 95%CI. Table 1 shows the distribution of participants and their different levels of WMSDs. Most participants (605, 94.5%) had some level of WMSD. Over half of them (334, 52.2%) had severe disorders.

Table 1: Distribution of WMSDs in the Neck, Shoulders, and Upper Back among Thai University Faculty Members (n=640)

Level of WMSDs	n (%) neck, shoulder, upper back	n (%)* neck	n (%)* shoulder	n (%)* upper back
Level 0: No disorder	35 (5.5)	80 (12)	81 (13)	123 (19)
Level 1: Mild disorder	98 (15.3)	116 (18)	103 (16)	110 (17)
Level 2: Moderate disorder	130 (20.3)	147 (23)	116 (18)	163 (26)
Level 3: Severe disorder	334 (52.2)	281 (44)	306 (48)	225 (35)
Level 4: Very severe disorder	43 (6.7)	16 (3)	34 (5)	19 (3)

Remark: *Participants could report more than one affected body site; therefore, the percentages do not sum to 100%

The prevalence of WMSDs in this study is 59% (Figure 1). The GLMM results indicate that gender, stress level, posture, and use of non-ergonomic workstations significantly contribute to WMSDs in the neck, shoulders, and upper back ($p \leq 0.001$, 95% CI, Table 3). Participants experiencing high stress have a 4.80 times higher risk of developing WMSDs than people with mild stress. Individuals with poor posture are 2.67 times more likely to have WMSDs than those maintaining good posture. Females are 1.94 times more prone to experience WMSDs than males. Participants using non-ergonomic workstations have a 1.65 times greater risk of developing WMSDs compared to individuals using ergonomic workstations.

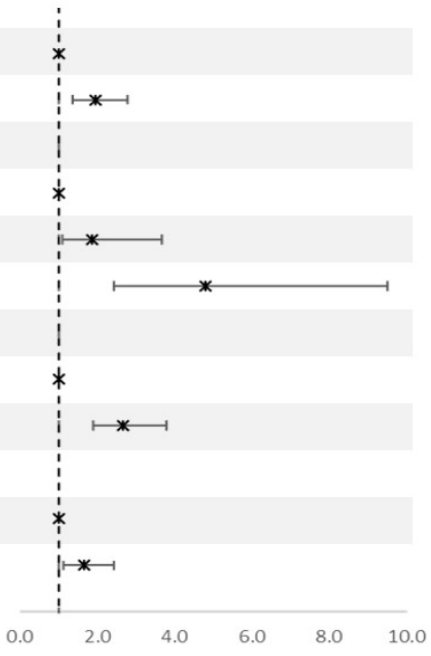


Remark: Participants who had no, mild, and moderate disorder are in the non-affected group. Those with severe or very severe disorders are in the affected group.

Figure 1: Prevalence of WMSDs in the Neck, Shoulders, and Upper Back among Thai University Faculty Members (n=640)

Table 2: Factors Affecting WMSDs in the Neck, Shoulders, and Upper Back among Thai University Faculty Members (n=640)

Variable	adjusted OR	95%CI
1. Gender		
Male	1	
Female	1.94	(1.35-2.78)
2. Stress Level		
Mild stress (0-23)	1	
Moderate Stress (24-41)	1.86	(1.08-3.66)
High to severe stress (≥42)	4.8	(2.42-9.51)
3. Work posture		
Appropriate	1	
Inappropriate	2.67	(1.88-3.79)
4. Workstation		
Ergonomic	1	
Non-ergonomic	1.65	(1.11-2.44)



Discussion

This study revealed a 58.9% prevalence of neck, shoulder, and upper back WMSDs. Notably, this figure is lower than those reported in other studies involving office workers (89.3%)[6] and information technology (IT) employees (66.8%)[11]. The difference may be attributed to the narrower classification criteria used in this study, which considered only participants experiencing severe to very severe symptoms as affected. Additionally, this study focused exclusively on MSDs in the neck, shoulders, and upper back, whereas other studies may have included a broader range of body regions. Furthermore, our findings suggest that high to severe stress, inappropriate work posture, being female, and non-ergonomic workstations contribute to

WMSDs. Participants with higher stress levels are at nearly five times greater risk of developing WMSDs than people with lower stress levels. This agrees with the study of Prasetya TAE et al. (2024).[4] Similarly, Montoya GNE and González PEV (2022)[24]also found a significant association between stress and MSDs, such that the greater the presence of MSDs, the greater are the symptoms of physiological stress, social behavior and intellectual and work ($r=0.407$, $p<0.01$) in a study among professors. Stress triggers the nervous system to release cortisol, a hormone that increases inflammation and causes muscle tension. This combination often results in muscle pain.[25] Inappropriate posture and using a non-ergonomic workstation increase the likelihood of developing WMSDs by 2.67 and 1.65 times, respectively. Inappropriate posture and using a non-ergonomic workstation include raised shoulders, an incorrect screen distance (outside 1.3–2.5 feet), and a monitor positioned too low (over 15° below eye level), causing excessive and prolonged downward head tilt. Hansraj[26] highlighted the significant increase in cervical spine stress associated with head flexion. The study reported that as the head flexed forward from a neutral 0° to 15, 30, 45, and 60°, the effective weight placed on the spine respectively increased from approximately 5 kg to 12, 18, 22, and 27 kg, emphasizing the substantial impact of posture on spinal load and muscles of neck, shoulder and upper back. The effect of non-ergonomic workstations on WMSDs is also evidenced in a randomized control clinical trial study on ergonomic workstation intervention by Lee S et al.[27] The study shows that an experimental group, which received an ergonomic workstation intervention, experienced less neck, shoulder, upper back, and wrist/hand pain. Additionally, this study found that female faculty members were more likely to experience WMSDs than their male counterparts. This result is consistent with the finding of Radin Umar et al.[28], Chi Tran Thi Quynh et al.[29], and a systematic review of WMSDs and their risk factors among computer users, which analyzed 20 studies.[16] The increased susceptibility in females may be attributed to anatomical differences, including smaller cervical vertebrae, lower muscle strength, and more delicate ligaments.[30]

Limitations

The current study used an online assessment that employed a questionnaire. To broaden the study scope, objective tools such as electromyography and motion tracking devices should be used in addition to online questionnaires. Another limitation of this study is the lack of differentiation between desktop and notebook use. Although the researcher regularly uses both, the questionnaire did not account for device type. Future studies should consider more specific categories to capture potential differences in usage patterns and outcomes.

Conclusion

Four factors impacting the occurrence of WMSDs among Thai university faculty members are stress level, poor posture, gender, and use of non-ergonomic workstations. University faculty members who use computers regularly have a high prevalence of WMSDs. They can reduce this by lowering their stress levels and maintaining appropriate work postures. Their universities can support them by providing ergonomic workstations.

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Appendix 1: Descriptive Statistics of Demographic, Physical and Mental Health, and Work-Related Factors of Northeastern Thailand University Faculty Members Who Regularly Use Computers (n=640)

	n (%)
1. Demographics	
1.1 Gender	
Female	409 (63.9)
Male	231 (36.1)
1.2 Age (Years)	
20-30	28 (4.4)
31-40	186 (29.1)
41-50	279 (43.6)
> 51	147 (22.9)
Mean±Standard Deviation = 44.3±7.7	
Median = 44 (Min. 23 – Max. 68)	
1.3 Marital status	
Single	283 (44.2)
Married	333 (52.1)
Widowed/Divorced/Separated	24 (3.7)
1.4 Education level	
Bachelor's Degree	16 (2.5)
Master's Degree	170 (26.6)
Doctoral Degree	454 (70.9)
2. Physical Health	
2.1 Underlying diseases	
Not present	439 (68.6)
Present	201 (31.4)
2.2 Frequent nighttime awakenings (times)	
0	295 (46.0)
1	179 (28.0)
2	134 (21.0)
> 2	32 (5.0)
2.3 Exercise or participation in sports (times per week)	
≥ 3 (exercise)	239 (37.4)
< 3 (no exercise)	401 (62.6)
2.4 Eating three meals a day	
Yes	368 (57.5)
No	272 (42.5)
2.5 Smoking	
Never smoked	596 (93.1)
Formerly smoked but quit	33 (5.2)
1-5 cigarettes per day	5 (0.8)
> 5 cigarettes per day	6 (0.9)

	n (%)
2.6 Alcohol consumption	
Non-drinker	408 (63.8)
Former drinker	44 (6.9)
Current drinker	188 (29.3)
2.7 Smartphone or tablet use (hours per day)	
< 3	117 (18.3)
3 - 4	206 (32.2)
5 - 6	155 (24.2)
>6	162 (25.3)
Mean±Standard Deviation = 5.3±3.4	
Median = 4 (Min. 2 – Max. 18)	
3. Mental health	
3.1 Stress level	
Mild stress (≤ 23 points)	54 (8.4)
Moderate stress (34-41 points)	287 (44.9)
High stress (42-61 points)	224 (35.0)
Severe stress (≥ 62 points)	75 (11.7)
Mean±Standard Deviation = 41.8±16.3	
Median = 39 (Min. 20 – Max. 93)	
3.2 Depression level	
Very mild or no symptoms of depression (0-6 points)	492 (76.9)
Mild symptoms (7-12 points)	115 (18.0)
Moderate symptoms (13-18 points)	27 (4.2)
Severe symptoms (≥ 19 points)	6 (0.9)
Mean±Standard Deviation = 4.1±4.2	
Median = 3 (Min. 0 – Max. 25)	
4. Work-Related Factors	
4.1 Number of years at this current job	
<10	216 (33.8)
10-20	255 (39.8)
>20	169 (26.4)
Mean±Standard Deviation = 13.8±8.8	
Median = 12.5 (Min. 0.5 – Max. 45)	
4.2. Time spent on computer (hours/day)	
4-6	422 (65.9)
>6	218 (34.1)
Mean±Standard Deviation = 6.19±2.23	
Median = 6 (Min. 4 – Max. 18)	
4.3 Static work posture	
No	34 (5.3)
Yes	606 (94.7)
4.4 Work postures	
Sit	345 (53.9)
Stand/walk	9 (1.4)
Sit and stand/walk	286 (44.7)
4.5 Appropriateness of work postures	
Appropriate	264 (41.3)
Inappropriate	376 (58.7)
4.6 Side job or other work performed outside this workplace	
No	502 (78.4)
Yes	138 (21.6)
4.7 Job stability and career advancement	
Yes	526 (82.2)
Not sure	100 (15.6)
No	14 (2.2)

	n (%)
4.8 Income sufficiency	
Sufficient with savings	222 (34.7)
Sufficient but no saving	278 (43.4)
Sufficient with no debt	62 (9.7)
Not sufficient with debt	78 (12.2)
4.9 Healthcare benefits	
Universal Health Coverage	6 (0.9)
Social Health Coverage	458 (71.6)
Government or State Enterprise Officer Healthcare Benefit	176 (27.5)
4.10 Job satisfaction with coworker relationship	
Low	280 (43.8)
Moderate	337 (52.6)
High	23 (3.6)
4.11 Participation in decision-making at work	
Low	279 (43.6)
Moderate	310 (48.4)
High	51 (8.0)
5. Workstation Ergonomics	
Ergonomic	168 (26.3)
Non-ergonomic	472 (73.7)

Appendix 2: Analysis of Factors Affecting the Neck, Shoulders, Upper Back of Faculty Members of Northeastern Thailand Universities Who Regularly Use Computers Employing Simple Logistic Regression Analysis (n=640)

Factors	N	Have WMSDs		Crude OR	95%CI	p-value
		n	%			
1. Demographics						
1.1 Gender						**<0.001**
Male	231	110	47.6	1	1	
Female	409	267	65.2	2.06	1.48-2.87	
1.2 Age (Years)						**0.050**
20-30	28	21	75.0	1	1	
31-40	186	120	64.5	0.60	0.24-1.50	
41-50	279	155	55.5	0.41	0.17-1.01	
> 51	147	81	55.1	0.40	0.16-1.02	
2. Physical health						
2.1 Underline diseases						**0.043**
Not present	439	247	56.2	1	1	
Present	201	130	64.6	1.42	1.00-2.01	
2.2 Frequent nighttime awakenings (times)						**0.002**
0	295	156	52.8	1	1	
1	179	104	58.1	1.23	0.84-1.79	
2	134	96	71.6	2.25	1.45-3.49	
> 2	32	21	65.6	1.70	0.79-3.65	
2.3 Exercise or participate in sports (times per week)						**0.005**
≥ 3 (exercise)	239	124	51.8	1	1	
< 3 (no exercise)	401	253	63.0	1.5	1.14-2.19	
2.4 Eat three meals a day						**0.010**
Yes	368	201	54.6	1	1	
No	272	21	64.7	1.52	1.10-2.10	

Factors	N	Have WMSDs		Crude OR	95%CI	p-value
		n	%			
2.5 Smartphone or tablet use (hours per day)						**0.210**
< 3	247	142	57.4	1	1	
3-4	177	98	55.3	0.91	0.62-1.35	
5-6	122	73	59.8	1.10	0.70-1.71	
>6	94	64	68.0	1.57	0.95-2.60	
3. Mental Health						
3.1 Stress level						**<0.001**
Mild stress (≤ 23 points)	54	15	27.7	1	1	
Moderate stress (34-41 points)	287	144	50.1	2.61	1.38-4.95	
High stress (42-61 points)	299	218	72.9	6.99	3.66-13.37	
3.2 Depression level						**<0.001**
No depression	492	272	55.2	1	1	
Mild	115	76	66.0	1.57	1.03-2.41	
Moderate to severe	33	29	87.8	5.86	2.0-16.9	
4. Work-Related Factors						
4.1. Time spent on computer (hours/day)						**<0.001**
<6	295	150	50.8	1	1	
6	127	78	61.4	1.54	1.01-2.35	
>6	218	149	68.3	2.08	1.44-3.00	
4.2 Static work posture						**0.001**
No	34	9	26.4	1	1	
Yes	606	368	60.7	4.29	1.97-9.36	
4.3 Appropriateness of work postures						**<0.001**
Appropriate	264	110	41.6	1	1	
Inappropriate	376	267	71.0	3.42	2.46-4.77	
4.4 Income sufficiency						**0.239**
Sufficient with savings	222	119	53.6	1	1	
Sufficient but no saving	278	171	61.5	1.38	0.96-1.97	
Sufficient with no debt	62	40	64.5	1.57	0.87-2.81	
Not sufficient with debt	78	47	60.2	1.31	0.77-2.21	
5. Workstation Ergonomic						**0.001**
Ergonomic	168	81	48.2	1	1	
Non-ergonomic	472	296	62.8.8	1.80	1.26-2.57	