

Comparison Of Work-Related Musculoskeletal Pain And Associated Risk Factors Among Academicians Based On Their Somatotypes

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Abstract

Background:

Musculoskeletal disorders (MSDs) are highly prevalent among academicians due to prolonged sedentary work, repetitive activities, and poor ergonomic practices. The influence of somatotype on MSD risk remains underexplored.

Methods:

A cross-sectional study was conducted among 250 academicians in the Delhi NCR region. Participants were classified into ectomorph, mesomorph, and endomorph groups based on anthropometric assessment. Data were collected using the Nordic Musculoskeletal Questionnaire (NMQ) and Dutch Musculoskeletal Questionnaire (DMQ). Statistical analysis was performed using SPSS, applying descriptive statistics, chi-square tests, and regression analysis with significance set at $p < 0.05$.

Results:

The prevalence of MSDs was high, with the lower back (58.4%), neck (52.0%), and wrists/hands (44.4%) most commonly affected. Pain intensity was predominantly moderate. Prolonged sitting and extensive computer use were identified as major risk factors. Endomorphic participants demonstrated relatively higher pain severity and multi-site involvement, though variations across somatotypes were not consistently significant.

Conclusion:

MSDs are common among academicians and are strongly associated with occupational and ergonomic factors. Somatotype may contribute to variations in pain patterns. Targeted ergonomic interventions and preventive strategies are essential to reduce MSD burden.

Keywords: Musculoskeletal disorders, academicians, somatotype, ergonomics, occupational health, sedentary behavior, pain prevalence.

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INTRODUCTION

Musculoskeletal disorders (MSDs) are among the most prevalent occupational health problems worldwide, affecting nearly 1.7 billion people and ranking as a leading cause of disability and reduced functional capacity. These disorders encompass a broad range of conditions involving muscles, joints, tendons, ligaments, and supporting structures, frequently manifesting as pain, stiffness, and impaired movement. Commonly affected regions include the cervical spine, lower back, shoulders, and upper limbs.

The growing burden of MSDs has significant implications for individuals, healthcare systems, and workplaces, contributing to decreased productivity, increased absenteeism, and diminished quality of life. In modern work environments, particularly within academic and office-based professions, the nature of work has shifted toward prolonged sedentary behavior and extensive computer use. Sustained static postures, repetitive movements, and poor ergonomic setups are key contributors to work-related musculoskeletal disorders (WMSDs).

These physical factors are often compounded by psychosocial elements such as job stress, high workload, and low job satisfaction, further increasing vulnerability to musculoskeletal pain (MSP). Evidence suggests that prolonged sitting alone may not be harmful, but when combined with awkward or non-neutral postures, it significantly elevates the risk of discomfort and chronic pain conditions.

Academics represent a high-risk occupational group due to the demands of teaching, research, and administrative responsibilities, which involve prolonged standing, writing, reading, and computer-based tasks. These repetitive and sustained activities can lead to cumulative strain, increasing the likelihood of developing MSDs. Additionally, lifestyle factors such as reduced physical activity and increased sedentary time further exacerbate these risks, contributing to broader health concerns including obesity, cardiovascular disease, and metabolic disorders. An important yet underexplored factor in understanding susceptibility to MSDs is body composition and somatotype. Somatotype classification—ectomorph, mesomorph, and endomorph—reflects variations in body structure, fat distribution, and muscle mass, which may

influence biomechanical stress and pain perception.

Individuals with different somatotypes may respond differently to occupational demands, potentially affecting the prevalence, severity, and distribution of musculoskeletal pain. Despite the recognized importance of ergonomic and occupational risk factors, limited research has examined the role of somatotype in WMSDs among academics. Therefore, this study aims to investigate the prevalence, severity, and associated risk factors of work-related musculoskeletal pain across different somatotypes, with the goal of supporting targeted preventive strategies and improving occupational health outcomes.

HYPOTHESIS

Alternative Hypothesis (H₁): Work-related musculoskeletal pain varies significantly across somatotypes (ectomorph, mesomorph, endomorph) among academics, with endomorphs exhibiting greater severity and multi-site involvement.

Null Hypothesis (H₀): No significant differences exist in the prevalence, risk factors, or intensity of work-related musculoskeletal pain across somatotypes among academics.

2. AIM AND OBJECTIVES

Aim

This study aims to compare the prevalence and severity of work-related musculoskeletal pain across different somatotypes (ectomorph, mesomorph, and endomorph) among academics and identify the occupational and individual risk factors associated with these pains.

Objectives

1. To assess the prevalence of work-related musculoskeletal pain among academics based on somatotype.
2. To identify specific risk factors contributing to work related musculoskeletal pain in each somatotype category.
3. To evaluate the impact of somatotype on the intensity and location of musculoskeletal pain

3. METHODOLOGY

Study Design

A cross-sectional observational study design was adopted to assess the prevalence of

musculoskeletal disorders (MSDs) and their associated factors among academicians. Data were collected at a single time point without any experimental manipulation, ensuring a naturalistic evaluation of participants.

Study Location

The research was conducted in higher education institutions across the Delhi NCR region, with Galgotias University serving as the primary site due to its diverse and representative academic population.

Study Population

The study included academicians such as professors, lecturers, and researchers who are routinely engaged in sedentary and computer-based work, placing them at higher risk for work-related musculoskeletal disorders (WMSDs).

Inclusion Criteria

Participants were included if they:

1. Were aged between 25 and 60 years
2. Had a minimum of one year of academic experience
3. Engaged in sedentary work for more than 4 hours per day

Exclusion Criteria

1. Participants were excluded if they:
2. Had a history of musculoskeletal surgery
3. Had congenital musculoskeletal abnormalities
4. Were involved in high levels of physical activity outside academic work
5. Were unable to comply with study procedures

Sampling Method

A stratified random sampling technique was used. Participants were grouped based on somatotype (ectomorph, mesomorph, endomorph), followed by random selection within each group to ensure balanced representation.

Sample Size

A total of 250 participants were included. The sample size was determined using standard statistical parameters, including a 95% confidence level and a 5% margin of error.

Outcome Measures

Musculoskeletal symptoms and occupational risk factors were assessed using validated

tools:

Nordic Musculoskeletal Questionnaire (NMQ):

Used to identify the presence and severity of musculoskeletal pain across nine body regions over the past 7 days.

Dutch Musculoskeletal Questionnaire (DMQ):

Used to evaluate ergonomic exposure and physical workload, including posture, repetition, force, and environmental factors.

Materials and Tools

1. Informed consent forms
2. Data collection sheets
3. NMQ and DMQ questionnaires
4. Anthropometric measurement tools (stadiometer, measuring tape)

Data Collection Procedure

Participants were recruited through institutional databases and provided informed consent prior to participation. Anthropometric measurements were recorded to determine somatotype classification. Subsequently, participants completed the NMQ and DMQ either in supervised settings or via a secure online platform. Collected data were verified, coded, and stored confidentially.

Data Analysis

Data were analyzed using IBM SPSS (Version 25). Descriptive statistics (mean, standard deviation, frequency, percentage) were used to summarize participant characteristics.

Inferential statistics included:

Chi-square test to assess associations between somatotype and musculoskeletal pain. Multiple regression analysis to identify predictors of pain based on ergonomic and occupational factors. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee. Participation was voluntary, confidentiality was maintained, and participants had the right to withdraw at any stage without consequences.

4. RESULT

A total of 250 academicians participated in the study, with a higher proportion of males

(57.6%) and most being assistant professors (66.8%). The majority reported standard working hours of 8–10 hours per day.

MSDs were highly prevalent, with the most affected regions being the lower back (58.4%), neck (52.0%), and wrists/hands (44.4%). Pain intensity was mainly moderate, with a considerable number reporting functional limitations and medical consultation for lower back pain. Somatotype distribution showed endomorphs (36.4%), ectomorphs (33.6%), and mesomorphs (30.0%). Endomorphic individuals demonstrated relatively higher multi-site pain patterns, though differences across somatotypes were not consistently significant. Ergonomic assessment revealed prolonged sitting (mean = 4.18) and extensive computer use (mean = 3.88) as the primary occupational risk factors. Regression analysis indicated that sedentary work patterns and ergonomic strain were significant predictors of musculoskeletal pain ($p < 0.05$).

Overall, MSDs were strongly associated with occupational workload, sedentary behavior, and poor ergonomic exposure among academicians.

Table 1: Age Distribution (Selected Categories)

Age	Frequency	Percent (%)
25	19	7.6
28	25	10.0
29	28	11.2
32	28	11.2
34	28	11.2
35	19	7.6
Total	250	100.0

The majority of participants were aged 29, 32, and 34 years (each 11.2%), while the least represented age groups were 25 and 35 years (7.6%). This indicates a predominantly

young to early-middle-aged academic workforce.

Table 2: Gender Distribution

Gender	Frequency	Percent (%)
Male	144	57.6
Female	106	42.4

Total	250	100.0
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Males constituted a higher proportion (57.6%) compared to females (42.4%) among the participants, suggesting a male-dominated academic environment.

Table 3: Medical Conditions (Top 5)

Condition	Frequency	Percent (%)
No/NA/Nil	179	71.6
Back pain	14	5.6
Diabetes	14	5.6
Bp/BP	10	4.0
Leg/Migraine/ Wrist pain (each)	5	2.0

9 hours (all forms)	20	8.0
7 hours (all forms)	19	7.6
6 hours or less	20	8.0
10+ hours	30	12.0
Total	250	100.0

Designation Group	Frequency	Percent (%)
Assistant Professor (all cases)	167	66.8
Professor	24	9.6
Student	15	6.0
Others (Lab Tech, MBA, Scholar, etc.)	44	17.6
Total	250	100.0

A large majority (71.6%) reported no medical conditions. Back pain and diabetes were the most common conditions (5.6% each), followed by high blood pressure (4.0%).

Table 4: University Designation

Most participants were Assistant Professors (66.8%), followed by Professors (9.6%). A small proportion were students (6.0%) or held other roles (17.6%), reflecting a sample mainly composed of teaching professionals.

Table 5: Average Daily Work Hours

Daily Work Hours	Frequency	Percent (%)
8 hours (all forms)	146	58.4

A majority (58.4%) reported working 8 hours daily. A considerable portion worked 10+ hours (12.0%), indicating some participants had extended work schedules.

Table 6: Body Type Distribution

Body Type	Frequenc y	Percen t (%)
Endomorp h (rounder with more fat)	91	36.4
Ectomorph (slim and long-limbed)	84	33.6
Mesomorp h (muscular and athletic)	75	30.0
Total	250	100.0

Endomorphs (36.4%) were the most common body type, followed by ectomorphs (33.6%) and mesomorphs (30.0%), suggesting a relatively balanced distribution among body types.

Table: Summary of Nordic Questionnaire Responses by Body Site (% Respondents Answering “Yes”)

B od y Sit e	1 2 - M o n t h T r o u b l e	Pr ev en te d N or m al Ac tiv ity	Sa w P h ys ici a n	Tr ou ble
N ec	5 2	50 .4	17 .6	40. 8%

k	. 0 %	%	%	
Sh ou ld er s	3 4 . 8 %	29 .2 %	15 .6 %	21. 2%
U pp er B ac k	3 8 . 8 %	29 .6 %	23 .2 %	33. 2%

Elbows	1	9	1	1
	5	.	3	3
	.	6	.	.
	2	%	2	2
Wrists/Hands	%		%	%
	4	3	7	2
	4	4	.	5
	.	.	6	.
Lower Back	4	8	%	2
	%	%		%
	5	5	2	4
	8	0	9	0
Hips/Thighs	.	.	.	.
	4	4	2	8
	%	%	%	%
	3	2	1	1
Knees	0	2	1	6
	.	.	.	.
	4	8	6	8
	%	%	%	%
Ankles/Feet	3	1	1	1
	4	8	3	8
	.	.	.	.
	0	4	2	4
	%	%	%	%
	2	2	1	1
	6	2	8	7
	.	.	.	.
	8	8	8	6
	%	%	%	%

The most affected areas were the **lower back (58.4%)**, **neck (52.0%)**, and **wrists/hands (44.4%)** over the past 12 months. These issues also frequently interfered with daily activities and prompted physician visits, especially for lower back and upper back pain.

One-Sample Statistics Summary

Body Site	Question Type	Mean	SD	SEM
Neck	12-Month	1.5	0.5	0.0

	Trouble	2	0	3
			1	2
	Prevented Activity	1	0	0
		.	.	.
		5	5	0
		0	0	3
			1	2
	Saw Physician	1	0	0
		.	.	.
		1	3	0
		8	8	2
			2	4
	7-Daily Trouble	1	0	0
		.	.	.
		4	4	0
		1	9	3
			2	1
	12-Month Trouble	1	0	0
		.	.	.
		3	4	0
		5	7	3
			7	0
	Prevented Activity	1	0	0
		.	.	.
		2	4	0
		9	5	2
			6	9
	Saw Physician	1	0	0
		.	.	.
		1	3	0
		6	6	2
			4	3
	7-Daily Trouble	1	0	0
		.	.	.
		2	4	0
		1	1	2
			0	6

Upper Back	12-Month Trouble	1 . 3 9	0 . 4 8 8	0 . 0 3 1
	Prevented Activity	1 . 3 0	0 . 4 5 7	0 . 0 2 9
	Saw Physician	1 . 2 3	0 . 4 2 3	0 . 0 2 7
	7-Day Trouble	1 . 3 3	0 . 4 7 2	0 . 0 3 0
Elbow	12-Month Trouble	1 . 1 5	0 . 3 6 0	0 . 0 2 3
	Prevented Activity	1 . 1 0	0 . 2 9 5	0 . 0 1 9
	Saw Physician	1 . 1 3	0 . 3 3 9	0 . 0 2 1
	7-Day Trouble	1 . 1 3	0 . 3 3	0 . 0 2

	ubl e		9	1
Wrist/Hand	12-Month Trouble	1 . 4 4	0 . 4 9 8	0 . 0 3 1
	Prevented Activity	1 . 3 5	0 . 4 7 7	0 . 0 3 0
	Saw Physician	1 . 0 8	0 . 2 6 6	0 . 0 1 7
	7-Day Trouble	1 . 2 5	0 . 4 3 5	0 . 0 2 8

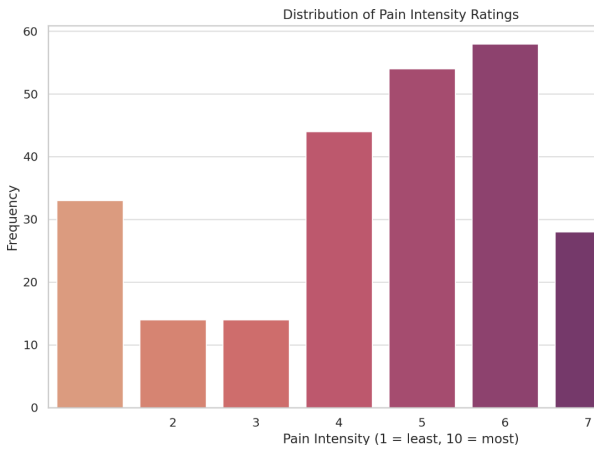
Lower Back	12-Month Trouble	15841	0431	0031
	Prevented Activity	1503	0053	0032
	Saw Physician	129	0456	0029
	7-Day Trouble	141	0492	0031
Hip/Thighs	12-Month Trouble	13061	0461	0029
	Prevented Activity	1230	0420	0027
	Saw Physician	1112	0321	0022
	7-Day Trouble	117	0375	0024
Knees	12-Month Trouble	134	047	003

	Neck Trouble		5	0
	Prevented Activity	158	0388	0025
	Saw Physician	1513	0339	0021
	7-Day Trouble	1418	0388	0025
Ankles/Feet	12-Month Trouble	127	0444	0028
	Prevented Activity	123	0420	0027
	Saw Physician	119	0391	0025
	7-Day Trouble	118	0382	0024

The highest mean values were observed for **lower back** and **neck trouble**, indicating high prevalence. Most areas showed mean scores above 1.30, suggesting that musculoskeletal disorders were common across various body parts.

Table 7: Pain Intensity Distribution

Pain Intensity	Frequency	Percent (%)
1	33	13.2
2	14	5.6
3	14	5.6
4	44	17.6
5	54	21.6
6	58	23.2
7	28	11.2
8	5	2.0



Pain intensity ratings were most frequently reported in the range of 4 to 6, with the highest at level 6 (23.2%), indicating moderate to moderately severe pain among many respondents.

Table: One-Sample Test Results of Job Task Frequency (N = 250)

Job Task	Mean	t	df	p-value	95% (Lower Upper)
Repetitive	3.552	2.89	249	.000	3.31 – 3.79
Working	2.916	3.457	249	.000	2.75 – 3.00

Standing for long time	3.500	3.711	2.49	.000	3.28 – 3.72
Sitting for long time	4.184	4.263	2.49	.000	3.99 – 4.38
Computer work for long time	3.880	3.976	2.49	.000	3.69 – 4.07
Walking	2.804	3.345	2.49	.000	2.64 – 2.97

					8
Moving loads (>5 kg) study materials	3.620	3.763	2.49	.000	3.43 – 3.81
Exertion of hands/arms	2.340	3.347	2.49	.000	2.10 – 2.50

		9			—
					2
					·
					4
					8

Tasks like **sitting for long hours**, **computer work**, and **repetitive hand use** had high mean values and were statistically significant ($p < 0.001$), indicating they were very common among participants' daily duties.

Table 8: Descriptive Statistics of Previous Work Activities (N = 250)

Previous Work Activity	Mean	SD	SE
Standing for long periods	2.10	1.050	0.066
Job requiring exertion of arms/hands	2.49	1.138	0.072
Working with vibration tools	2.48	1.015	0.064
Driving vehicles	2.62	1.081	0.068
Working in uncomfortable postures	2.61	1.115	0.070
Working in the same position for long periods	2.43	1.032	0.065
Doing repetitive tasks many times per minute	2.34	1.057	0.067

Participants' previous jobs most commonly involved **moving heavy loads**, **squatting/kneeling**, and **driving**, suggesting prior occupational physical strain. The mean values reflect moderate-to-high exposure to

Sitting for long periods	2.66	0.970	0.061
Computer work for long periods	2.28	0.927	0.059
Squatting/kneeling for long periods	3.09	1.219	0.077
Moving loads (>5 kg)	3.17	1.195	0.076
Moving heavy loads (>20 kg)	3.33	1.349	0.085

physical demands.

5. DISCUSSION

This study shows a high prevalence of musculoskeletal disorders (MSDs) among academicians, mainly affecting the lower back, neck, and upper limbs. The findings reflect the impact of prolonged sitting, continuous computer use, and poor ergonomic practices in academic work environments.

Moderate pain intensity reported by most participants indicates a noticeable effect on daily functioning and productivity. Although endomorphic individuals showed slightly higher multi-site pain, somatotype differences were not strongly significant, suggesting occupational factors play a greater role than body type alone.

Prolonged sitting and extended computer use emerged as key predictors of MSDs, supporting existing evidence on sedentary work-related health risks. Overall, the results highlight the need for ergonomic improvements, regular activity breaks, and posture awareness programs to reduce MSD risk among academicians.

6. CONCLUSION

This study highlights the high prevalence of musculoskeletal disorders (MSDs) among academicians, particularly affecting the lower back, neck, and wrists/hands. These findings reflect the impact of prolonged sitting, repetitive computer use, and poor ergonomic practices commonly observed in academic settings. A significant proportion of participants reported moderate pain intensity,

indicating a notable effect on daily functioning and work efficiency. The study population mainly consisted of early to mid-career professionals, with extended working hours emerging as a potential contributing factor. Although somatotype distribution was relatively balanced, individuals with endomorphic characteristics may be more prone to increased mechanical stress, suggesting a possible association with greater pain severity. However, further research is required to establish this relationship conclusively. Occupational factors such as sustained static postures, repetitive tasks, and inadequate workstation design were identified as key contributors to MSDs. Additionally, the presence of comorbid conditions like diabetes and hypertension in some participants may further aggravate musculoskeletal symptoms, highlighting the need for a multidimensional approach to prevention. Despite limitations such as self-reported data and the cross-sectional design, the study emphasizes the importance of early intervention. Implementing ergonomic improvements, encouraging regular physical activity, and promoting posture awareness can help reduce MSD risk among academicians. Future studies should adopt longitudinal designs and further explore the role of body composition and metabolic health in the development of MSDs to support more targeted and effective preventive strategies.

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