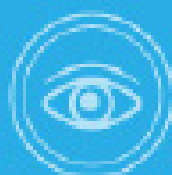




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Association between Musculoskeletal Problems, Physical Activity, and Perceived Stress among Undergraduate Physical Therapy Students: A Cross-Sectional Study

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ABSTRACT

University students are already vulnerable to musculoskeletal issues, especially when they are taking physical programs like physical therapy, which are physically demanding. There is, however a paucity of evidence on the relationship between musculoskeletal issues, physical activity, and perceived stress in combination with the undergraduate physical therapy students in Pakistan. These associations are crucial in enlightening the student health promotion strategies. To investigate the relationship between perceived stress, musculoskeletal issues, and physical activity in undergraduate physical therapy students. A cross-sectional study was carried out on 197 undergraduate physical therapy students who were sampled using non-probability convenience sampling from affiliated institutes of Khyber Medical University. Information was gathered based on the Nordic Musculoskeletal Questionnaire, the International Physical Activity Questionnaire Short Form, and the Student Stress Inventory. SPSS 26 was used to analyze the data in a statistical manner. Descriptive statistics were done, and associations were estimated using chi-square testing. The statistical value of 0.05 was deemed significant. The musculoskeletal pain was very high, especially in the neck (61.9%), the lower back (61.9%), and then the shoulders (43.7%). There was no statistically significant relationship between musculoskeletal problems and perceived stress ($p > 0.05$), as well as between musculoskeletal problems and physical activity levels ($p > 0.05$). Nonetheless, the level of stress varied depending on the academic year ($p = 0.040$), and gender was correlated with the amount of physical activity ($p = 0.001$). The overwhelming majority of students (61%) were in the moderate stress range (SSI score 61-90), and the stress increased in the first academic year. The level of musculoskeletal issues is very high in undergraduate physical therapy students, but it was not strongly related to physical activity or perceived stress in the sample. The high difference between the levels of stress in different academic years gives credence to the necessity of specific interventions to handle stress. The findings are relevant to the student health policy as they provide an understanding of the necessity of systematic ergonomic training, the need to train on stress reduction as early in physical therapy education as possible, and physical activities that can be promoted among genders as part of physical therapy education.

INTRODUCTION

The MSK is the largest organ system in the body. It has bones that hold the body up, articular cartilage that lets joints slide, ligaments and tendons that connect all the bones, and muscles that have blood vessels and nerves attached to them that let them contract and move the body. This is what life is built on (Barone & Szychlińska, 2023; Cao *et al.*, 2024). There are parts of the MSK that help with both passive and active movements. The first one is made up of the bones, cartilage, and many other complex structures that connect them, like joints, ligaments, and intervertebral discs (Coglianese, 2024). Physical inactivity, or an activity level below current guidelines, has a significant effect on public health worldwide, as it is one of the main risk factors for non-communicable illnesses and is thought to be the cause of 9% of all premature deaths worldwide (Larsen *et al.*, 2022). PA is seen as a crucial component in the battle against depression, anxiety, and cognitive decline as well as in the prevention and management of chronic, non-communicable illnesses (Moreira *et al.*, 2022).

Higher PA makes it possible to spend less time sitting overall, which improves both physical and mental health (Moreira *et al.*, 2022; Nguyen *et al.*, 2021). Stress may be defined as environmental occurrences or long-term situations that objectively endanger the bodily and/or mental health and well-being of people in a given culture at a certain age (Raj & Kanagasabapathy, 2020). Stress is frequently linked to mental and physical illnesses that eventually result in psychological problems, including incompatibilities, disputes, and acts of aggression (Fteiha & Awwad, 2020). Based on earlier studies, MSDs are a major global public health concern and a common reason for absenteeism (Grabara, 2023). Injuries affecting the muscles, tendons, ligaments, joints, nerves, blood vessels, and any other tissue involved in supporting movement are known as MSDs. This hurts day-to-day activities and can lead to a single incident or accumulated trauma (Uchenwoke Chigozie Ikenna *et al.*, 2022). Individuals with MSDs may have minor to severe symptoms. Pain, tingling, numbness, stiffness, swelling, tremor, disturbed sleep, and a burning feeling are all signs of early

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musculoskeletal problems (Agatha *et al.*, 2022). Acute or chronic musculoskeletal pain is an uncomfortable feeling that impacts the muscles, bones, ligaments, tendons, and even the nerves. As the pain worsens, it may interfere with everyday tasks and may result in impairment. It might be challenging to treat musculoskeletal pain when it develops into chronic pain syndromes (Shafi *et al.*, 2022). Typically, MSDs are divided into three stages: mild, which is characterized by temporary weariness and discomfort at work that does not interfere with productivity or sleep at night; moderate, which is characterized by symptoms that continue during work hours and interfere with task repetition; and severe, which is characterized by persistent pain at rest and a major impairment in daily functional capacity (Ahmad *et al.*, 2025). There are two types of MSDs: specific and non-specific. Specific MSDs have distinct clinical features, while non-specific MSDs manifest as pain without any clear particular disorder (K Saraswathi Krishnan *et al.*, 2021). According to numerous reports, MSDs are among the most common health problems among healthcare professionals, notably among hospital staff, nurses, and physical therapists (Hämmig, 2020). MSD risk can also be influenced by the field of study, since university students in health care disciplines are more likely to develop MSDs than those in non-health care studies (Parto *et al.*, 2023). The most prevalent MSDs, affecting 43.3% of the population at any given moment, are neck and lower back pain. Lower back pain is said to be the most prevalent MSD that adults experience at work (Moodley *et al.*, 2020).

There are a number of contributing variables, such as poor ergonomic practices at work or outside of it, which include improper lifting methods, bad postures, and poor body mechanics that put stress on the body and increase tiredness, which leads to MSDs (Tang, 2022). MSDs can result from both an excessive physical workload and extended periods of ineffective sedentary behavior (Grabara, 2023). Poor mental health, advanced age, being a healthcare student, excessive screen time, and intense academic pressure were among the variables linked to the existence of MSDs (Parto *et al.*, 2023).

The WHO estimates that musculoskeletal problems affect 1.71 billion individuals globally. In South Asia, the prevalence varies with age and diagnosis, affecting 369 million people. By 2030, there will be a rise in MSDs in developing nations. In Pakistan, the prevalence of MSDs is 70% higher among people living in poverty than in developed countries (Bonfiglioli *et al.*, 2022; Tabassum *et al.*, 2023). According to its global burden, MSDs affect 23% to 45% of people in Latin America, 26.8% of people in South India, 17% of people in Mexico, 50% of people in Peru, 7% to 14% of people in India, 36.19% of people in Indonesia, 41.9% to 54.13% of people in Iran, 26% of people in Bangladesh, 39% of people in Kuwait, and 53.7% of people in Argentina (Ahmed *et al.*, 2024).

PTs, masseurs, nurses, midwives, dentists, and surgeons have recorded a prevalence of more than 80% (Jacquier-Bret & Gorce, 2023). MSDs are quite prevalent among

PTs; globally, prevalence rates are over 80%. Certain nations, including Korea, Australia, and the United States, have reported reaching the 90% mark (Gorce & Jacquier-Bret, 2023). Studies indicate that Asian nurses exhibit a greater annual prevalence of musculoskeletal disorders (MSDs) in at least one anatomical region, with rates varying from 40% to 95%. In Western populations, the most impacted anatomical regions are the shoulders, neck, and lower back, with prevalences of 17–75%, 34–63%, and 29–64%, respectively (K. S. Krishnan *et al.*, 2021).

A research study carried out in Saudi Arabia revealed that 64.8% of undergraduates, 48.4% of whom were medical students, reported having musculoskeletal discomfort. The area that was most impacted was the lower back (33.4%) (O. M. Hendi *et al.*, 2019; Khattak, Khan, Mazhar, & Rehman, 2022; Rajkumari *et al.*, 2025). Across the globe, the prevalence rate for students ranges from 32.9% to 89.3%. This may result in a potential decline in student educational attainment (Uchenwoke Chigozie Ikenna *et al.*, 2022). Previous studies have examined MSDs among dentists, nurses, and police officers; significant gaps remain in understanding these issues specifically among students in Peshawar's demanding academic environment. This study will investigate the association of both PA and academic stress with MSK problems among physiotherapy students at KMU-affiliated institutions. The findings will guide focused strategies, including ergonomic training and stress management programs, to enhance student health and reduce MSK-related issues in Peshawar's academic institutions. This evidence-based approach will help create healthier learning environments by informing institutional policies and preventive strategies for future healthcare professionals.

Objective

To investigate the relationship between perceived stress, musculoskeletal issues, and physical activity in undergraduate physical therapy students.

Google Scholar and PubMed were utilized as primary search engines for conducting this literature review. A systematic search strategy was implemented to identify relevant studies published between January 2020 and September 2025, ensuring the inclusion of the most current and evidence-based literature. The search focused on articles examining musculoskeletal problems, physical activity levels, and stress perception among healthcare students, particularly physical therapy undergraduates.

LITERATURE REVIEW

Ikenna *et al.* (2022) conducted a cross-sectional study to investigate the correlation between university students' physical activity levels, academic stress, and musculoskeletal disorders. A statistically significant association was identified between heightened academic stress and the onset of musculoskeletal disorders, with a notable prevalence of these conditions noted. Their analysis revealed no substantial link between the incidence of MSDs and PA levels, even though male students

exhibited a greater overall PA level (U. C. Ikenna *et al.*, 2022). Grabara (2023) conducted a study revealing that individuals with a higher incidence of musculoskeletal disorders (MSDs) were less inclined to participate in physical activity (PA) compared to those with fewer uncomfortable bodily regions. The study additionally indicated that the incidence of MSDs may correlate with reduced levels of physical activity. (14).

Khattak *et al.* (2022) did a study investigating the correlation between musculoskeletal discomfort and physical activity among final-year DPT students in Peshawar, uncovering a significant incidence of musculoskeletal disorders (MSDs). Due to the curriculum integrating prolonged periods of academic inactivity with the physical demands of practical sessions and clinical training. These practical experiences often involve tasks such as patient handling, manual therapy techniques, and maintaining awkward postures (Khattak, Khan, Mazhar, ., *et al.*, 2022). A cross-sectional study conducted by S.G. Tejaswi *et al.* in 2023 aimed to assess musculoskeletal discomfort among medical students and its correlation with perceived stress levels in India. A sample of 200 medical students was comprised of fifty students from the third, fifth, seventh, and ninth semesters, revealing that a majority had experienced musculoskeletal pain in the prior 12 months. This incidence was markedly correlated with elevated felt stress levels and diminished quality of life (S. G. Thejaswi *et al.*, 2023).

OM Hendi *et al.* (2021) conducted a study to find out how common MSDs are among Saudi Arabian medical students at Taif University and how they relate to stress. Multistage cluster sampling was used to pick 640 medical students in total for the sample size. A 10-k questionnaire and an NMQ were used as the outcome measures. According to the survey, out of 640 medical students, 45.9% of men and 54.1% of females reported having musculoskeletal discomfort. This type of pain was more common among 4th-year & 6th-year students, and the most common complaint was neck pain, which was followed by low back and shoulder pain. Pain was the main reason why work was avoided. over 50% of medical students, with a strong correlation with preclinical and female students. Two-thirds of medical students suffer from stress (Hendi *et al.*, 2021).

Ogunlana MO *et al.* (2021) conducted a study in South Africa to assess the prevalence of musculoskeletal pain among undergraduate students in occupational therapy and physiotherapy programs. They looked at 145 students and found that a very high percentage (89.7%) of them had MSDs (Ogunlana *et al.*, 2021). Serra *et al.* (2020) performed a cross-sectional study to investigate the correlation between stress perception and physical activity among police officers in Brazil. The research identified a substantial correlation between stress levels and the incidence of musculoskeletal disorders (MSDs). The incidence of musculoskeletal disorders (MSDs) was reduced among police officers who participate in physical activity (PA) (Serra *et al.*, 2020).

A cross-sectional study by BX Morais *et al.* (2021) included undergraduate health students from a public institution in southern Brazil. The research identified a correlation between felt stress and the prevalence of mental health concerns among undergraduate students in the health sector (B. X. Morais *et al.*, 2021). Ikenna *et al.* (2022) studied the link between musculoskeletal problems, physical activity behavior, and academic pressure among Nigerian students as part of their examination into the interrelated factors impacting student health. They used three validated tools to ensure reliable and consistent measurement of these important variables: the NMQ, which was used to determine the prevalence and anatomical distribution of MSDs; the SSI, which was used to measure academic-related stress; and the IPAQ, which was utilized to assess participants' levels of PA (Uchenwoke Chigozie Ikenna *et al.*, 2022).

Pedrosa Luna Oliveira J *et al.* (2022) conducted a study to investigate the link between musculoskeletal pain, sleep quality, and migraine in connection to physical activity levels among college students. The research employed the Nordic Musculoskeletal Symptom Questionnaire to evaluate musculoskeletal problems and the International Physical Activity Questionnaire to assess physical activity levels (Pedrosa Luna Oliveira *et al.*, 2022). Kuorinka *et al.* developed the Nordic Musculoskeletal Questionnaire (Kuorinka *et al.*, 1987). The nine symptom locations—neck, shoulders, upper back, elbows, lower back, wrists, hips, knees, and ankles—were illustrated on a body map. This questionnaire uses “yes” and “no” responses to indicate if musculoskeletal diseases are present or not. The frequency of musculoskeletal problems throughout the previous seven and twelve months was also recorded using the questionnaire. The test-retest process yielded a reliability coefficient of approximately 0.8 (Deakin *et al.*, 1994; Uchenwoke Chigozie Ikenna *et al.*, 2022; Kuorinka *et al.*, 1987).

MATERIALS AND METHODS

This study was a cross-sectional study that was done in a period of six months upon approval of the research committee of Ahmad Medical Institute. The environment involved 5 institutes of KMU in Peshawar: Ahmad Medical Institute, National College of Science, Institute of Health Science, School of Health Science, and PEF University System. An online calculator of Raosoft was used to determine the sample required, and the values were 197 with a 95 percent confidence level, 5 percent margin of error, 50 percent distribution of response, and a population of 400. Non-probability convenience sampling was used to select the participants. Undergraduate physical therapy students of the first to final year of their course were recruited in the study to include both males and females aged between 17 and 30 years. Students with physical disabilities, known psychiatric or psychological disabilities, medical conditions including rheumatoid, neurological, vascular, cardiac, renal or respiratory illnesses were left out.

Data Collection Procedure

Following the consent from the Research Committee of Ahmad Medical Institute (AMI), data collection was conducted at Ahmad Medical Institute, National College of Science, Institute of Health Science, School of Health Science, and the PEF university system in Peshawar. Before data collection, permission was obtained from the relevant Head of the Institute. All willing participants were informed about the study's goal and methodology, and formal informed consent was secured from each individual. An information sheet was supplied to them. The selected participants were evaluated based on the inclusion and exclusion criteria. Data were gathered utilizing the following tools.

Three standardized tools helped to collect data. The Nordic Musculoskeletal Questionnaire was administered to determine musculoskeletal symptoms within the last 7 days and 12 months in nine body parts, such as neck, shoulders, back, upper and lower limbs. It is presented in a simple yes or no format that has a body map, and it is fairly good in terms of validity, with test-retest reliability of about 0.80. The International Physical Activity Questionnaire Short Form was used to measure physical activity and assess walking, moderate, and vigorous physical activities that are conducted during the past 7 days. The setting of total activity was done in MET minutes per week based on the usual values of MET, which are 3.3 walk, 4.0 moderate, and 8.0 vigorous. The level of activity was categorized into low, which was under 600, moderate, which ranged between 600 and 3000 minutes per week, and high, which was above 3000 minutes per

week. The instrument demonstrates good reliability of approximately 0.80. Student Stress Inventory, a 40-item questionnaire that includes physical, interpersonal, academic, and environmental stress, was used to measure stress levels. The answers were measured on a four-point scale of never to always. Scores are of low, moderate, and high stress levels. Its internal consistency is good with a Cronbach's alpha of 0.85.

Data Analysis Procedure

Version 26 of SPSS (Statistical Package for the Social Sciences) was used to analyze the data. The mean and standard deviation were computed for numerical data, including weight, height, and age. Frequencies and percentages were used to describe categorical information, such as grade level and gender. Tables and graphs were used to display the results.

The chi-square test was used to evaluate the associations among categorical variables.

RESULTS AND DISCUSSION

Results

There were 197 participants, 108 females (54.8%), and 89 males (45.2). Most of them were IHS (24.4%), PEF (21.8), SHS (21.3), NCS (20.8), and AMI (11.7). The mean age was 21.29 ± 1.53 years. The mean weight was 59.59/11.97kg and the mean height 1.64/0.11 m. The first-year students constituted the majority (31.0%), then there were second-year students (28.4%), then third, fourth and fifth year students in smaller proportions.

Table 1: ??????????

Variable	Category / Statistic	Frequency (n)	Percentage (%)	Mean \pm SD	Range
Gender	Male	89	45.2	—	—
	Female	108	54.8	—	—
Institute	IHS	48	24.4	—	—
	PEF	43	21.8	—	—
	SHS	42	21.3	—	—
	NCS	41	20.8	—	—
	AMI	23	11.7	—	—
Age (years)	—	—	—	21.29 ± 1.53	—
Weight (kg)	—	—	—	59.59 ± 11.97	40–100
Height (m)	—	—	—	1.64 ± 0.11	1.20–1.87
Academic Year	1st Year	61	31.0	—	—
	2nd Year	56	28.4	—	—
	3rd Year	28	14.2	—	—
	4th Year	26	13.2	—	—
	5th Year	26	13.2	—	—

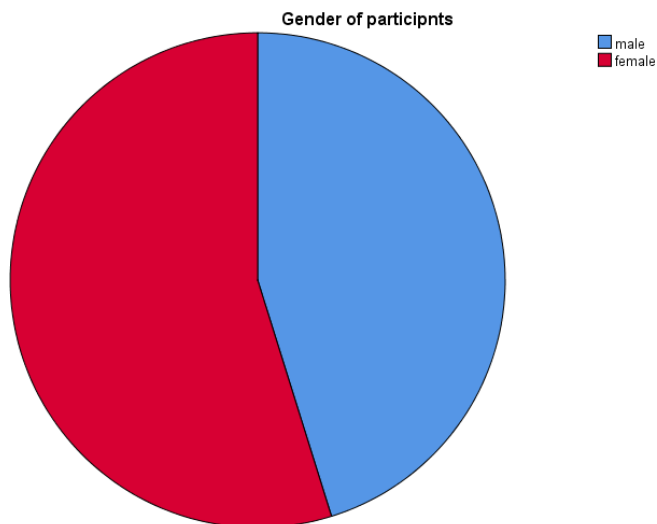


Figure 1: Gender of participants

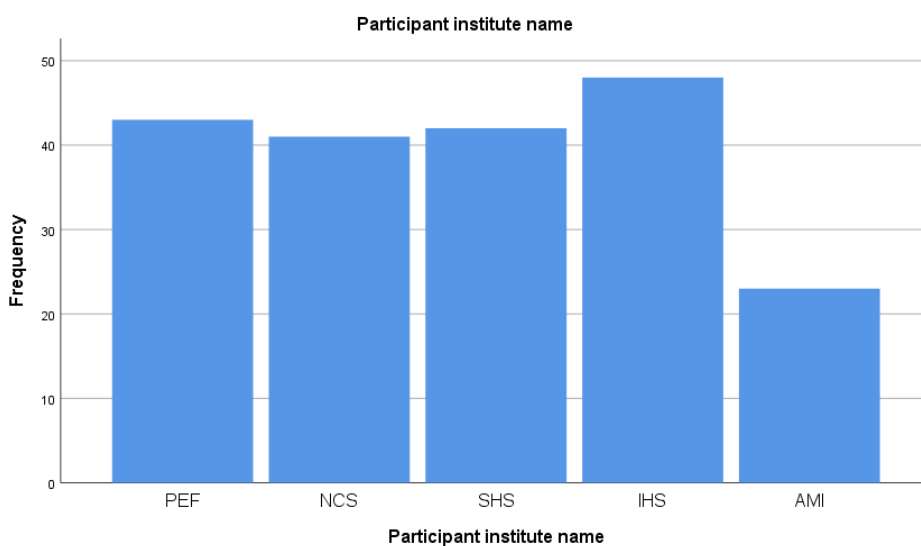


Figure 2: Distribution of Participants by Institute

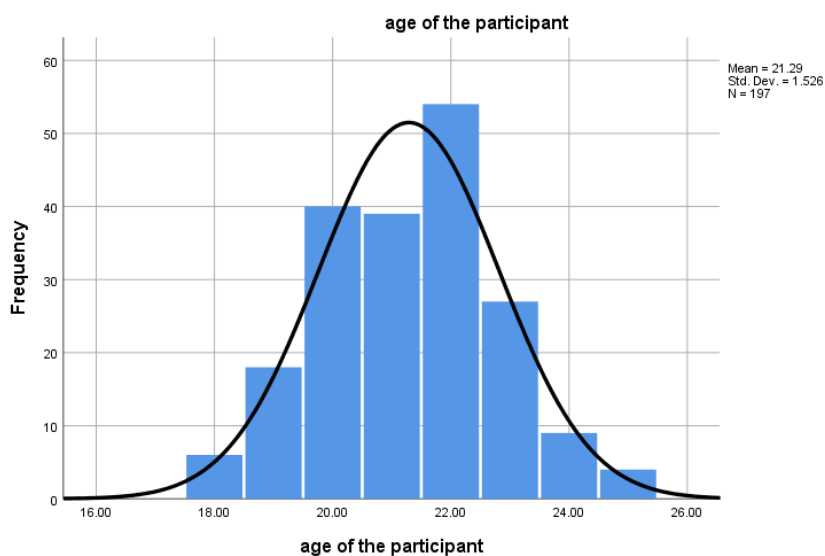


Figure 3: Age of participants

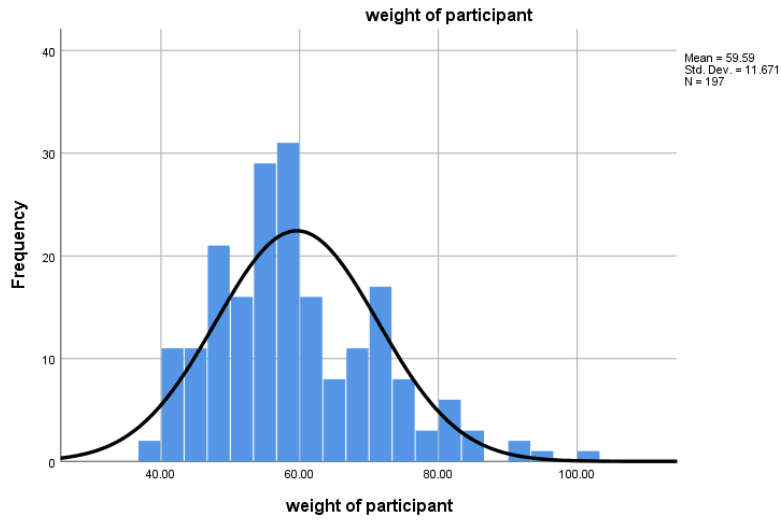


Figure 4: Weight of participants

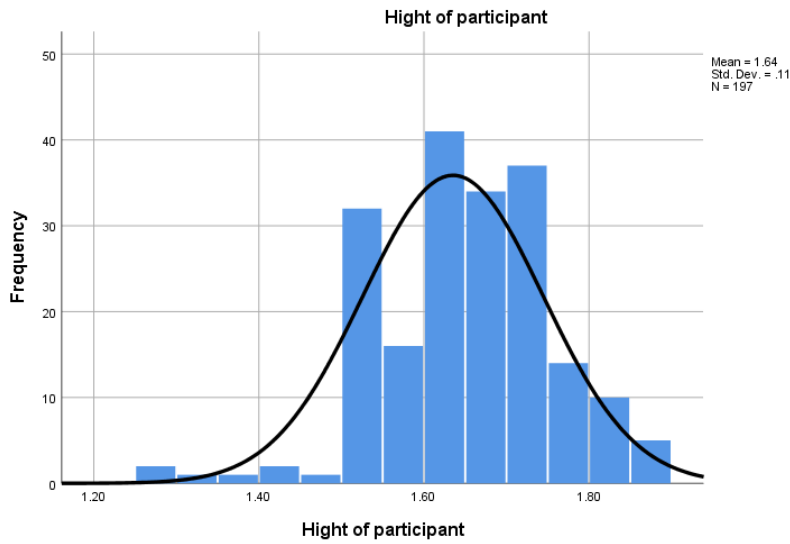


Figure 5: Height of Participants

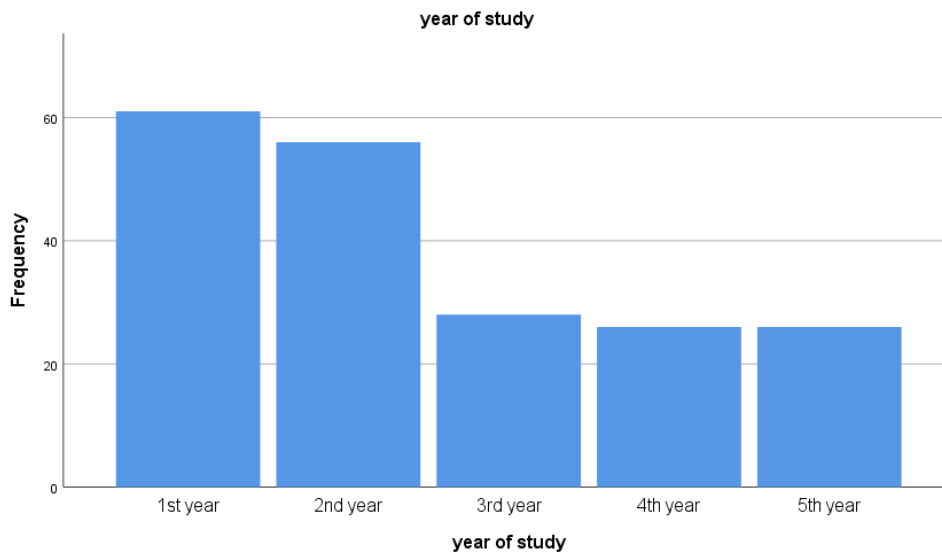


Figure 6: Year of study

Musculoskeletal Pain Prevalence by Body Area

The neck and lower back demonstrated the highest prevalence rates, each affecting 61.9% of participants (n=122). Shoulder pain represented the third most common complaint, reported by 43.7% of the sample

(n=86). Conversely, ankle pain was the least prevalent condition, affecting only 20.8% of participants (n=41), followed by elbow pain, which was reported by 27.9% of respondents (n=55).

Table 2: Musculoskeletal Pain Prevalence by Body Area

Body Area	Reported Pain	Number of Cases (N)	Percentage (%)
Neck	Yes	122	61.9%
	No	75	38.1%
Shoulder	Yes	86	43.7%
	No	111	56.3%
Elbow	Yes	55	27.9%
	No	142	72.1%
Wrist	Yes	79	29.9%
	No	138	70.1%
Upper Back	Yes	69	35.0%
	No	128	65.0%
Lower Back	Yes	122	61.9%
	No	75	38.1%
Hip	Yes	58	29.4%
	No	139	70.6%
Knee	Yes	62	31.5%
	No	135	68.5%
Ankle	Yes	41	20.8%
	No	156	79.2%

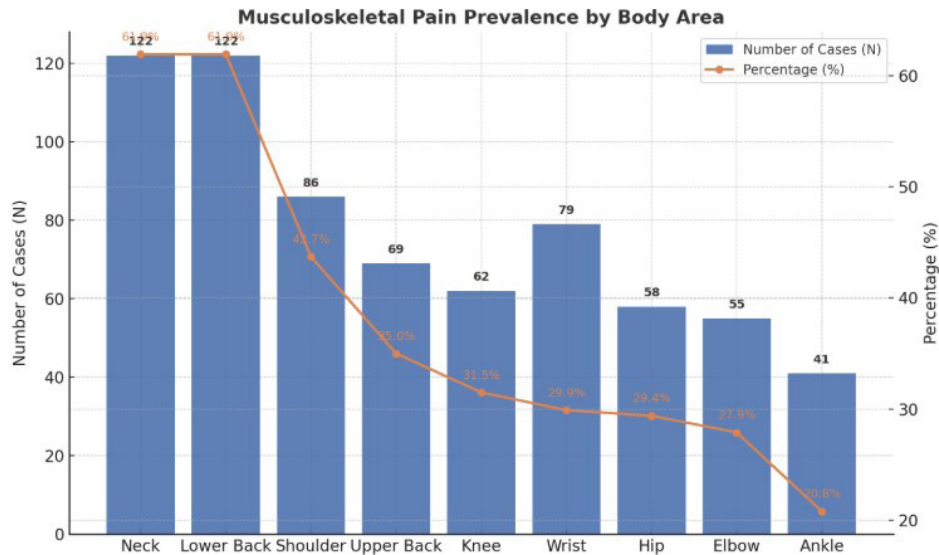


Figure 7: Musculoskeletal Pain Prevalence by Body Area

Chi-Square Test between SSI Scoring and IPAQ Categories

The cross-tabulation analysis examining the relationship between perceived stress levels and physical activity

categories (IPAQ) yielded no statistically significant association. conclusion is supported due to $p=0.331$, which exceeds the conventional significance threshold of $p<0.05$.

Table 3: Chi-square between SSI scoring and IPAQ categories

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	105.639 ^a	100	.331

Likelihood Ratio	113.377	100	.170
Linear-by-Linear Association	.979	1	.322
N of Valid Cases	197		

Cross Tabulation between SSI Categories and Gender of Participants

The majority of participants fell within the moderate stress category (61-90), comprising 61.8% of males (n=55) and 67.6% of females (n=73). The low-stress category (30-60) included 33.7% of male participants (n=30) and 29.6%

of female participants (n=32). Only a small proportion of participants (3.6%) reported high stress levels (91-120), with minimal variation between genders (4 males, 3 females). Analysis of the relationship between perceived stress levels (SSI categories) and gender revealed no statistically significant association ($p = 0.633$).

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Table 4: Cross tabulation between SSI Categories and gender

		Gender of participants		Total
		male	female	
SSI categories	30-60	30	32	62
	61-90	55	73	128
	91-120	4	3	7
Total		89	108	197
p-value*		0.633		

*Chi-square test was applied

Cross Tab between PA and Year of the Study

No statistically significant association was found between

physical activity levels and academic year of study ($p = 0.425$).

Table 5: Cross-tab between PA and year of the study

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.084 ^a	8	.425
Likelihood Ratio	10.245	8	.248
Linear-by-Linear Association	3.300	1	.069
N of Valid Cases	197		

Chi-Square Tests between BMI and Gender

The Pearson Chi-Square test indicated no significant

association ($p = 0.136$) between BMI and gender.

Table 6: Chi-Square Tests between BMI and gender

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	178.696 ^a	159	.136
Likelihood Ratio	245.806	159	.000
Linear-by-Linear Association	2.271	1	.132
N of Valid Cases	197		

Cross Tabulation between Physical Activity Levels and Musculoskeletal Discomfort

No statistically significant associations were found between physical activity levels and musculoskeletal pain

across any body area (all p-values >0.05). The distribution of pain reports was remarkably consistent across activity levels for most anatomical regions.

Table 7: Cross-tabulation between physical activity levels and musculoskeletal discomfort

Body Area	Response	IPAQ scoring categories			Total
		0-599	600-3000	>3000	
Neck	No	7 (9.3%)	38 (50.7%)	30 (40.0%)	75
	Yes	11 (9.0%)	59 (48.4%)	52 (42.6%)	122
	p-value*	0.936			
Shoulders	No	10 (9.0%)	55 (49.5%)	46 (41.4%)	111
	Yes	8 (9.3%)	42 (48.8%)	36 (41.9%)	86
	p-value*	0.994			
Elbows	No	13 (9.2%)	72 (50.7%)	57 (40.1%)	142
	Yes	5 (9.1%)	25 (45.5%)	25 (45.5%)	55
	p-value*	0.782			
Wrists/Hands	No	11 (8.0%)	67 (48.6%)	60 (43.5%)	138
	Yes	7 (11.9%)	30 (50.8%)	22 (37.3%)	59
	p-value*	0.574			
Upper Back	No	11 (8.6%)	61 (47.7%)	56 (43.8%)	128
	Yes	7 (10.1%)	36 (52.2%)	26 (37.7%)	69
	p-value*	0.704			
Lower Back	No	7 (9.3%)	37 (49.3%)	31 (41.3%)	75
	Yes	11 (9.0%)	60 (49.2%)	51 (41.8%)	122
	p-value*	0.996			
Hips/Thighs	No	14 (10.1%)	71 (51.1%)	54 (38.8%)	139
	Yes	4 (6.9%)	26 (44.8%)	28 (48.3%)	58
	p-value*	0.438			
Knees	No	10 (7.4%)	66 (48.9%)	59 (43.7%)	135
	Yes	8 (12.9%)	31 (50.0%)	23 (37.1%)	62
	p-value*	0.394			
Ankles/Feet	No	14 (9.0%)	74 (47.4%)	68 (43.6%)	156
	Yes	4 (9.8%)	23 (56.1%)	14 (34.1%)	41
	p-value*	0.546			

*Chi-square test was applied

Cross Tabulation between Stress Levels and Musculoskeletal Discomfort

No statistically significant associations were found

between stress levels (SSI categories) and musculoskeletal pain across any body area, as all p-values exceeded the 0.05 significance threshold.

Table 8: Cross tabulation between stress levels and musculoskeletal discomfort

Body Area	Response	SSI categories			Total
		30-60	61-90	91-120	
Neck	No	29 (38.7%)	43 (57.3%)	3 (4.0%)	75
	Yes	33 (27.0%)	85 (69.7%)	4 (3.3%)	122
	p-value*	0.207			
Shoulders	No	37 (33.3%)	70 (63.1%)	4 (3.6%)	111
	Yes	25 (29.1%)	58 (67.4%)	3 (3.5%)	86
	p-value*	0.809			

Elbows	No	46 (32.4%)	92 (64.8%)	4 (2.8%)	142
	Yes	16 (29.1%)	36 (65.5%)	3 (5.5%)	55
	p-value*	0.632			
Wrists/Hands	No	48 (34.8%)	87 (63.0%)	3 (2.2%)	138
	Yes	14 (23.7%)	41 (69.5%)	4 (6.8%)	59
	p-value*	0.114			
Upper Back	No	37 (28.9%)	86 (67.2%)	5 (3.9%)	128
	Yes	25 (36.2%)	42 (60.9%)	2 (2.9%)	69
	p-value*	0.558			
Lower Back	No	17 (22.7%)	56 (74.7%)	2 (2.7%)	75
	Yes	45 (36.9%)	72 (59.0%)	5 (4.1%)	122
	p-value*	0.082			
Hips/Thighs	No	44 (31.7%)	92 (66.2%)	3 (2.2%)	139
	Yes	18 (31.0%)	36 (62.1%)	4 (6.9%)	58
	p-value*	0.260			
Knees	No	44 (32.6%)	87 (64.4%)	4 (3.0%)	135
	Yes	18 (29.0%)	41 (66.1%)	3 (4.8%)	62
	p-value*	0.737			
Ankles/Feet	No	53 (34.0%)	98 (62.8%)	5 (3.2%)	156
	Yes	9 (22.0%)	30 (73.2%)	2 (4.9%)	41
	p-value*	0.319			

*Chi-square test was applied

Crosstabulation between IPAQ Scoring Categories and Gender of Participants

The table shows that male participants were significantly more physically active than female participants in this study

population, with a greater proportion engaging in high-intensity physical activity. A statistically significant association was found between gender and physical activity levels, as the $P=0.001$, which is lower than the $P=0.05$ threshold.

Table 9: IPAQ scoring categories: * Gender of participants Crosstabulation

		Gender of participants		Total
		male	female	
IPAQ scoring categories	0-599	2	16	18
	600-3000	40	57	97
	>3000	47	35	82
Total		89	108	197
p-value*		0.001		

*Chi-square test was applied

Crosstabulation between SSI Categories and Year of Study

A significant association was found between stress levels and academic year ($p=0.040$). Second-year students

showed the highest low-stress representation (41.1%), while fourth-year students had the highest high-stress proportion (11.5%). Moderate stress was most prevalent across all years.

Table 10: SSI categories * year of study Crosstabulation

		year of study					Total
		1st year	2nd year	3rd year	4th year	5th year	
SSI categories	30-60	17	23	13	3	6	62
	61-90	43	32	14	20	19	128
	91-120	1	1	1	3	1	7
Total		61	56	28	26	26	197
P-value*		0.040					

*Chi-square test was applied

Discussion

This study examined the relationship between musculoskeletal complaints, physical activity, and perceived stress among undergraduate physical therapy students enrolled in various institutes affiliated with Khyber Medical University, Peshawar. A total of 197 students participated, comprising 45.2% males and 54.8% females. The highest proportion of students was recruited from IHS (24.4%), followed by PEF (21.8%), SHS (21.3%), NCS (20.8%), and AMI (11.7%). The participants had a mean age of 21.29 years (SD = 1.53), with the majority falling between 20 and 22 years of age. Anthropometric measurements showed a mean body weight of 59.59 kg (SD = 11.97) and a mean height of 1.64 m (SD = 0.11). Representation across academic years was relatively balanced, with first-year (31.0%) and second-year students (28.4%) forming the largest subgroups. The prevalence of musculoskeletal pain was notably high, with the neck and lower back each reported by 61.9% of participants, followed by shoulder pain (43.7%). By contrast, ankle pain (20.8%) and elbow pain (27.9%) were the least frequently reported. Despite these high prevalence rates, no statistically significant associations were observed between physical activity levels (IPAQ categories) and musculoskeletal pain in any body region ($p > 0.05$). Similarly, stress perception (SSI categories) did not demonstrate significant associations with musculoskeletal symptoms ($p > 0.05$).

Regarding stress levels, most students were categorized within the moderate stress range (scores 61–90), whereas only 3.6% fell into the high-stress category. Gender-based analysis indicated no significant association between stress levels and gender ($p = 0.633$). Likewise, no significant relationships were identified between BMI and gender ($p = 0.136$) or between physical activity levels and year of study ($p = 0.425$). However, male students reported significantly higher levels of physical activity compared with female students ($p = 0.001$). Furthermore, stress perception was significantly associated with year of study ($p = 0.040$), with fourth-year students exhibiting the highest proportion of elevated stress.

In South Africa, M.O. Ogunlana *et al.* (2021) conducted a study among undergraduate occupational therapy and physiotherapy students, which reported a 12-month prevalence of musculoskeletal pain as high as 89.7%, with the neck (66.2%) and low back (64.4%) being the most commonly affected regions (Ogunlana *et al.*, 2021). These results support our study's findings that 61.9% of individuals had lower back discomfort and 61.9% had neck pain. This was linked to uncomfortable seats, poor sitting posture, and extended computer use. Repetitive laptop use and extended study sessions were found to raise MSP (Ogunlana *et al.*, 2021). A study conducted on final-year Doctor of Physical Therapy students in Peshawar by S.S. Khattak *et al.* (2022) found that most of the students (82.3%) had musculoskeletal pain, but they didn't find the association between MSDs and physical activity (Khattak, Khan, Mazhar, Marghalara, *et*

al., 2022). Our study shows the same results, indicating no statistically significant association between physical activity levels and musculoskeletal pain, despite the high prevalence of neck, low back, and shoulder pain. Multiple factors, including psychological stress and physical exercise, influence the prevalence of MSDs, as the results demonstrate. Psychosocial stress significantly affected medical students. Stress can be a risk factor for medical students and can lead to more severe kinds of mental health disorders. Thus, we propose that stress was more significant for MSDs than physical exercise (Khattak, Khan, Mazhar, Marghalara, *et al.*, 2022).

A study conducted at Jazan University by S. Thejaswi *et al.* (2023) reported that the results show musculoskeletal pain was prevalent among medical students, and no significant association was seen between PA levels and MSK pain (S. Thejaswi *et al.*, 2023). Similar results were seen in our study, where no significant association between musculoskeletal pain and PA was found, even when activity levels varied among subgroups (male > female). The lack of a precise definition of "regular exercise" and its measurement in this research may be the cause of variations in the relationship between MSP and physical activity (S. G. Thejaswi *et al.*, 2023). Alturkistani *et al.* (2020), who conducted a study involving 640 medical students at Taif University, reported a 33.3% prevalence of lower back pain, with no significant association between pain and psychological stress ($p = 0.409$) (Alturkistani *et al.*, 2020). These results are consistent with our investigation, which found that although musculoskeletal discomfort was prevalent, it was not significantly associated with perceived stress as determined by the SSI.

Hendi *et al.* (2021) reported a high prevalence of musculoskeletal disorders among medical students, but no significant association was identified between perceived psychological stress and musculoskeletal complaints (Hendi *et al.*, 2021). These results back up our research, which found that although musculoskeletal pain was prevalent, it was not significantly associated with perceived stress. Multiple variables, including gender, psychological stress, physical activity, and work pressure, may influence the start and incidence of MSDs rather than a single factor. Our results find that the neck and lower back were the most common sites of musculoskeletal discomfort, with shoulder pain coming in second. No significant associations between physical activity levels and musculoskeletal discomfort in any part of the body were found, despite these high prevalence rates, which is supported by Tami *et al.* (2021) they reported that physical activity and MSDs were not shown to be significantly associated for either 7-day or 12-month MSDs. However, they discovered that sedentary subjects had a greater frequency of 7-day MSDs than active participants (Tami *et al.*, 2021).

Additionally, Ikenna *et al.* (2022) found that 66.02% of Nigerian undergraduate students had musculoskeletal diseases and that there was no significant association between MSDs and physical activity levels (Uchenwoke Chigozie Ikenna *et al.*, 2022). This contrasts with the

findings of research conducted by Hendi *et al.* on Saudi Arabian health specialist students, which showed a strong correlation between the students' PAL and the onset of MSDs. This may suggest that other factors, such as psychological stress, which is known to be high among medical students, may contribute significantly to MSDs for medical students, and that PA level is not the sole contributing factor. Stress is linked to the more severe types of MSDs and is a probable risk factor for MSDs in medical students. As a result, we suggest that stress is comparatively more significant for MSD than PA level (O. Hendi *et al.*, 2019).

According to O.Q. Samarah *et al.* (2023), a study conducted among medical students in Jordan reported a 12-month prevalence of musculoskeletal pain of 78.1%, with the neck (61.2%), lower back (63.1%), and shoulders (45.5%) identified as the most frequently affected regions (Samarah *et al.*, 2023). These results are in line with our study, which found that 61.9% of participants had neck pain, while an identical percentage had lower back pain, with shoulder discomfort coming in second at 43.7%. Thejaswi *et al.* (2023) conducted a cross-sectional study among medical students in Sikkim, India. They found a strong association between students' stress levels and MSP. They explained this positive relationship between MSP and perceived stress by pointing out that psychological stress causes muscles to tense up more, particularly in the neck and shoulders, which raises the risk of musculoskeletal problems (S. G. Thejaswi *et al.*, 2023). In contrast, our study did not observe a significant association between perceived stress and MSDs among physical therapy students, despite a similarly high prevalence of pain.

A cross-sectional study was carried out by Morais *et al.* (2021). They found a significant association between stress and MP in the upper and lower limbs and spinal column of undergraduate health students at a public institution in southern Brazil (B. Morais *et al.*, 2021). By contrast, our study found no significant association between perceived stress levels and musculoskeletal symptoms among undergraduate physical therapy students. According to Morais *et al.*, stress causes the production of hormones like cortisol and adrenocorticotrophic, which exacerbate pain perception and induce muscle tension. Because of this tension, there is less blood flow between the tissues, which limits the amount of oxygen and nutrients that are exchanged between them. As a result, acid residues build up in the tissues, causing fatigue and discomfort in the muscles (B. Morais *et al.*, 2021).

Musculoskeletal diseases were investigated by Rajkumari *et al.* (2025) in 403 undergraduate healthcare students in Sindh, Pakistan. Physical activity levels were shown to be significantly associated with musculoskeletal diseases in the ankles/feet ($p = 0.017$), knees ($p = 0.009$), and elbows ($p = 0.000$) (Rajkumari *et al.*, 2025). On the other hand, there was no obvious association between physical activity levels and musculoskeletal problems in any part of the body in our sample of undergraduate physical therapy students.

Limitations

- The cross-sectional design captures stress at a single point in time and cannot establish causality.
- Some students required additional explanation of the questionnaire items, which could have influenced their understanding and responses.
- Potential confounding factors such as socioeconomic background, personal health, and family support systems were not controlled.

CONCLUSION

The cross-tabulation analysis indicated that the relationship between the categories of SSI and the year of study is statistically significant ($p = 0.040$). Most of the students fell in the moderate range of stress (61-90), especially in lower years, but students in the later years showed a relatively higher variance in lower and higher SSI range. These results show that the level of stress is not equally distributed but it changes as the course of academic advancement, which highlights the role of academic pressures during a particular year.

Recommendations

- Provide counseling, time management workshops, and career guidance to support students in higher academic years.
- Create intervention programs that are specific to the stressors of the junior and senior students and are year-specific.
- Implement organized orientation and mentorship programs that can assist first and second-year students to cope with the academic demands.
- Longitudinal research will help to monitor the changes in student stress throughout the period and assess the effectiveness of the interventions carried out

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