

ASSOCIATION OF RULA AND UPPER LIMB MUSCULOSKELETAL PAIN IN FINE ARTS STUDENTS

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Abstract: *This study aimed to investigate the relationship between RULA and upper limb musculoskeletal pain in fine arts students. The research was conducted in Lahore, Pakistan, and involved 250 students from various universities, including NCA, BNU, PU, and GC University. To assess ergonomics, RULA was used, while the Nordic Musculoskeletal Questionnaire (NMQ) was used to evaluate pain. The data was analyzed using SPSS v20, and the Chi-square test was used to determine the association between RULA and upper limb musculoskeletal pain. The results revealed that shoulders were the most common area of pain reported by students in the last 12 months (68%) and last 7 days (60%), followed by wrist/hand pain (66% and 55.2%, respectively). The Chi-square value showed a significant association between RULA Score and Shoulder Pain (p-value 0.04) and RULA Score and Wrist Pain (p-value 0.05); however, there was no significant association between RULA and Elbow pain (p-value 0.861). Statistical significance was set at p-value ≤ .05. In conclusion, this study found a significant association between RULA and upper limb musculoskeletal pain in fine arts students.*

Keywords: RULA, Musculoskeletal Pain, Nordic Musculoskeletal Questionnaire, Ergonomic Assessment, Fine Arts Students.

Introduction

Musculoskeletal disorders are the most common type of occupational illness, accounting for approximately 50% of new cases in Europe (Cabeças, 2006). In the artistic community, these disorders are often called performance-related musculoskeletal disorders (PRMD) or playing-related musculoskeletal disorders, specifically in musicians (Chan and Ackermann, 2014; Yang et al., 2021).

A study conducted by Unal and Çifçili found that musculoskeletal pain in visual artists is extremely prevalent. The study emphasized the need for policymakers in fine arts faculties to prioritize strategies to prevent and manage musculoskeletal pain among students and faculty members (Sur Unal and Cifcili, 2020).

Another study by Fiocco et al. compared the prevalence of musculoskeletal complaints between musicians and non-musicians. The findings revealed musculoskeletal complaints were significantly more common among musicians, particularly in the upper extremities. While this study focused on musicians, it provides valuable insights into the potential prevalence of musculoskeletal disorders among fine art students who engage in similar repetitive and physically demanding activities (Kok et al., 2013).

Several risk factors contribute to developing work-related musculoskeletal disorders among fine arts students. These

risk factors include prolonged sitting, repetitive motions, poor posture, inadequate ergonomics, and lack of breaks (Anwar et al., 2023; Xiaoyu and Musib, 2023). Fine art students often spend long hours working on their art projects, which can lead to overuse injuries and musculoskeletal imbalances (Akbari-Chehrehbargh et al., 2023; Cruder, 2023).

In addition to physical factors, psycho-social factors such as stress and pressure to meet deadlines can also contribute to the development of musculoskeletal disorders. The demanding nature of the fine art curriculum and the need for artistic perfection can lead to increased stress levels and musculoskeletal tension (Barbayannis et al., 2022).

Education is vital in raising awareness among fine art students about proper posture, body mechanics, and ergonomics. Students should be educated on the risks associated with prolonged sitting, repetitive motions, and poor posture. They should also be provided with information on stretching exercises, self-care techniques, and the importance of regular breaks to prevent musculoskeletal strain (Baadjou et al., 2018).

Ergonomics is another crucial aspect of preventing work-related musculoskeletal disorders. Fine art students should be provided with ergonomic equipment, such as adjustable chairs, ergonomic tools, and workstations that promote

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good posture and reduce strain on their bodies. The workspace layout should also be optimized to minimize repetitive motions and awkward postures (Getchell, 2019). Self-care techniques, such as stretching exercises, mindfulness practices, and stress management strategies, can also significantly prevent and manage work-related musculoskeletal disorders. Fine art students should be encouraged to prioritize their physical and mental well-being, as this can positively impact their overall musculoskeletal health (Da Costa and Vieira, 2008; Girgin et al., 2022).

Work-related musculoskeletal disorders (WMSDs) are a significant concern among fine arts students. These students often engage in activities requiring prolonged periods of sitting, repetitive motions, and awkward postures, which can strain their muscles, tendons, and joints. The prevalence of WMSDs among fine art students is a growing issue that needs to be addressed to ensure their well-being and long-term artistic careers. Therefore, this research aims to find an association between RULA and upper limb musculoskeletal pain in Fine arts students. The study will help fine arts students identify upper limb disorders due to poor ergonomics. Students will be aware of their postures during work and can correct their ergonomics in the future.

Methodology

This analytical associational study recruited Fine Arts students from the National College of Arts, Lahore Beacon House National University, Lahore, Punjab University, Lahore, and Lahore College for Women. 250 Students of age group 16-28, having practical hours of at least 5-6 hours, were included, while those with any musculoskeletal disorder or any other inflammatory disease were excluded. Informed consent was taken from the administration rather than from the students. RULA assessment sheet was used for ergonomic assessment. It contains variables like upper arm position, lower arm position, wrist position, wrist twist, muscle use score, force/load score, neck position, and trunk

position. The Nordic Musculoskeletal Disorders Questionnaire was used to assess shoulder, elbow, and wrist pain.

The Data was analyzed using SPSS v20. Mean±SD was calculated for numeric variables, i.e., age, BMI, and frequency, and the percentage was shown with categorical variables, e.g., Gender. The chi-square test was applied to find the association between RULA and upper limb musculoskeletal pain in fine arts students.

Results

Two hundred fifty students voluntarily participated in the study; of them (36%) were males and 160 (64%) were females, and the mean age of the participants was 21.81 with an SD of 1.698. The maximum age of the participants was 28, while the minimum was 16 years. Most participants had a normal BMI value (68%), while 14.8% were overweight. (Table 1).

The physical activity level of 130 (52%) students was mild, 75 (30%) was moderate and 45(18%) intense. 150 (60%) students had an average break time of about 30-60 minutes while 60 (25%) had about 15-30 minutes break time. 125 (50%) had RULA scores between 1-2, which shows no risk, while 95 (38%) were at mild risk, 20 (8%) at moderate risk, and 10(4%) at high risk for developing work-related musculoskeletal disorders as assessed through RULA Scale (Table 2).

The most common area of pain in the last 12 months and last 7 days, as reported by students, was the shoulder (68% & 60%), followed by wrist/hand (66% & 55.2%) respectively. The majority of the students were unable to carry out their activities due to shoulder and wrist pain (51.2% and 54%, respectively).

The Chi-square value of association shows a significant association between RULA Score and Shoulder Pain (p-value 0.04) and RULA Score and Wrist Pain (p-value 0.05).

Table 1 Demographic Information:

Variable	Constructs	N (250)	%age
Age	Mean (SD)	21.81(1.698)	
	Minimum	16	
	Maximum	28	
BMI	Underweight (<18.5)	23	9.2%
	Normal (18.5-24.9)	170	68%
	Overweight (25-29.9)	37	14.8%
	Obese (= or >30)	20	8%
Gender	Male	90	36%
	Female	160	64%

Table 2 Educational Profile and Total RULA score:

Variable		N (250)	%age
Academic Level	College level	50	20%
	Graduate	112	44.8%
	Masters	88	35.2%
Physical Activity Level	Mild	130	52%
	Moderate	75	30%
	High	45	18%
Duration Of Break	15-30 minutes	60	24%

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	30-60 minutes	150	60%
	60-90 minutes	40	16%
RULA SCORE	1-2 (No Risk, no change required)	125	50%
	3-4 (mild risk, change required)	95	38%
	5-6 (Moderate risk, further investigation and changes required soon)	20	8%
	7 (Very high risk, implement change now)	10	4%
Academic Level	College level	50	20%
	Graduate	112	44.8%
	Masters	88	35.2%
Physical Activity Level	Mild	130	52%
	Moderate	75	30%
	High	45	18%
Duration Of Break	15-30 minutes	60	24%
	30-60 minutes	150	60%
	60-90 minutes	40	16%
RULA SCORE	1-2 (No Risk, no change required)	125	50%
	3-4 (mild risk, change required)	95	38%
	5-6 (Moderate risk, further investigation and changes required soon)	20	8%
	7 (Very high risk, implement change now)	10	4%

Table 3 Common areas of pain reported by Students.

	Shoulder		Elbow		Wrist/Hand	
	YES N(%)	NO N(%)	YES N(%)	NO N(%)	YES N(%)	NO N(%)
Have you at any time during the last 12 months had trouble (such as aches, pain, discomfort, and numbness) in:	170 (68%)	80 (32%)	65 (26%)	190 (76%)	165 (66%)	85 (34%)
During the last 12 months, have you been prevented from carrying out normal activities (e.g., job, housework, hobbies) because of this trouble in:	128 (51.2%)	122 (48.8%)	50 (20%)	200 (80%)	135 (54%)	115 (46%)
During the last 12 months, have you seen a physician for this condition:	100 (40%)	150 (60%)	35 (14%)	215 (86%)	100 (40%)	150 (60%)
During the last 7 days have you had trouble in:	150 (60%)	100 (40%)	47 (18.8%)	203 (82.2%)	138 (55.2%)	112 (44.8%)

Table 4: chi-square test of association between RULA score and UE pain

	Value	Df	Asymp. Sig. (2-sided)
Shoulder Pain	6.029	2	0.04
Elbow pain	0.299	2	0.861
Wrist Pain	5.99	2	0.05

Discussion

In the current study, the students reported having increased pain in the shoulder (60%) and Wrist/ Hand (55.2%), among other regions of the Upper extremity. RULA score showed that 125 (50%) had no risk, 95 (38%) were at mild risk, 20 (8%) were at moderate risk, and 10(4%) were at high risk for developing work-related musculoskeletal disorders. The reason might be the poor posture and lack of ergonomics as the students are engaged in projects that require prolonged sitting and continuous work without appropriate breaks. A study on fine arts students and faculty in 2020 also revealed a high prevalence of work-related musculoskeletal disorders, with women being more affected than men. The major area of reported pain in the upper limb was the shoulder (25.9%). Most participants reported pain in the Lower back (51.3%) and neck (45.7%). The means REBA score was 5.2, which shows moderate risk. The following results were consistent with the current study, which shows

that 95 (38%) students were at mild risk, 20 (8%) at moderate risk, and 10(4%) at high risk for developing work-related musculoskeletal disorders as assessed through RULA Scale (Sur Unal and Cifcili, 2020). The results of a previous study conducted on painters were in consonance with the current study; the painters reported a high prevalence of WMSD and had a high prevalence of low back pain(76.92%), neck pain (69.23%) and shoulder pain (57.6%). 57.7% of workers rated their pain intensity as moderate and 26.9% as high intensity. The reason is the shoulder increased work duration, less break time, and improper working conditions (Pandey and Kiran, 2020). The same was true in the current study, where the average break duration among students was 30-60 minutes, and the major area of pain reported was the shoulder region. The results of the study conducted by Dipayan Das et al. In 2020, it contradicted the current study where handicraft workers were assessed for musculoskeletal symptoms using the RULA assessment scale and REBA scale. The results

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showed increased neck, lower back, and knee pain (61.1%, 74.8%, and 54.7%, respectively) due to improper sitting posture, decreased rest intervals, job pressure, and work experience (Das and Singh, 2022). In the current study, fine arts students showed an increased prevalence of shoulder pain under the same working circumstances.

A study was done in Iran on the population of communication companies. They found that the presence of musculoskeletal problems in the workers was very high in shoulders (73%), knees (67.1%), and back (66.7%) by using RULA sheet risk levels assessed, which was high. They claim that there is an association between musculoskeletal problems and risk levels in the lower back (Choobineh et al., 2007).

Another study was done to find out the musculoskeletal problems in shoe workers and checked their relation with the working atmosphere. The presence and grimness of problems were high among workers. Bad posture during work, stress of work, and continuous working were significantly associated with musculoskeletal problems (Dianat and Salimi, 2014).

The study was conducted on workers of handicrafts involved in sewing projects to check the frequency of musculoskeletal problems and associated risk factors. The presence of musculoskeletal symptoms was high in the neck (57.9%), lower back (51.6%), and shoulders (40.5%) and associated with poor posture during work. Pain in the neck and shoulder was high in females. Neck and lower back pain associated with time in years. Prolonged sitting is associated with the neck pain (Dianat and Karimi, 2016).

The study done in India to evaluate working posture in small-scale industries showed that individuals were at high risk and needed to pay attention to their postures due to improper ergonomics. The major reason for the disorder was static posture (Ansari and Sheikh, 2014). Similarly in the current study, 95(38%) students were at mild risk of developing WMSDs due to poor ergonomics. The results were supported by another study conducted in West Bengal, where most of the sculptors complained of pain in the lower back and shoulder region (Basu et al., 2023).

Conclusion

A significant association exists between RULA and upper limb musculoskeletal pain in fine arts students. Thus, the Null hypothesis is accepted. The result showed a significant association between RULA score and shoulder pain and Wrist/hand pain because the P value (0.04 and 0.05) is less than an alpha value (0.05). There is no significant association between the RULA score and elbow pain because the p-value (0.861) exceeds the alpha value (0.05).

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by Concerned Department

Consent for publication

Not applicable

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Conflict of interest

The authors declared absence of conflict of interest.

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