International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

# Prevalence of Work-Related Musculoskeletal Disorders for Teaching & Non-Teaching Personnel of Doña Remedios Trinidad Romualdez Educational Foundation Inc: A Correlation Study

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**Abstract:**
The study aimed to answer the questions: (1) Is there prevalence of work-related musculoskeletal disorders in Doña Remedios Trinidad Romualdez Educational Foundation Inc. (DRTREFI) teaching and non-teaching personnel; (2) Is there a significant relationship between WMSDs and (a) demographics, (b) environmental factors, & (c) ergonomic factors. A descriptive observational study with a correlational design was utilized. There were 126 respondents in total, consisting of 52 teaching personnel and 74 non-teaching personnel from DRTREFI. Respondents met the inclusion criteria of having worked at the institution for at least one year and experienced pain or discomfort in any body region in the past two months. The study mainly utilized two questionnaires namely the Prevalence of work-related musculoskeletal disorders for teaching & non-teaching personnel of Dona Remedios Trinidad Romualdez Educational Foundation Inc. Questionnaire (PWMSDTNTP), a researcher-made questionnaire, and the Work-related Musculoskeletal Disorder Form which was based on the Nordic Questionnaire. The lower back has the highest reported incidence of discomfort for the past 12 months (53.96%) and past seven days (24.60%), with the neck, shoulder, elbow, wrist/hand, upper back, thighs/hips, knees, and ankles, also having reports of pain and discomfort. There was a relevant correlation between discomfort experienced by the respondents and the demographic, environmental, & ergonomic factors with p values less than 0.05.The study concluded that WMSDs were prevalent in DRTREFI teaching and non-teaching personnel. Additionally, there was a significant relationship between demographic profiles, environmental factors, and ergonomic factors with WMSDs among the respondents.

**Keywords:** Work-related musculoskeletal disorders, teaching & non-teaching personnel, pain patterns.

## 1. INTRODUCTION

Musculoskeletal disorders (MSD) are a group of painful disorders of muscles, tendons, and nerves. Injuries can result from overuse and develop over time [1]. Work-related musculoskeletal disorders (WMSDs) are conditions in which the work environment and performance of work contribute significantly to the condition and/or the condition is made worse or persists longer due to work conditions [2]. Previous studies revealed a high prevalence of MSD among school teachers with the highest number in the lower back (56%) [3]. School canteen workers' most affected body parts in terms of discomfort and MSD were the neck (80%) & upper back (70%) [4].

## 2. NEED OF THE STUDY

With the high prevalence of MSDs in both teaching and non-teaching personnel, in relation to Article 4 Section 7.6 of the Commission on Higher Education Memorandum order No. 55 series of 2017 a need to conduct this study is useful to be able to devise a health and wellness program for the teaching and non-teaching personnel of DRTREFI aiming to reduce the prevalence of WMSDs and managing the pain and discomfort, promoting health and improved quality of life through the practice of the profession.

The objectives of the study includes answering the following questions: (1) Is there a prevalence of WMSDs in DRTREFI teaching and non-teaching personnel; (2) Is there a significant relationship between musculoskeletal disorders and (a) demographics, (b) environmental factors, & (c) ergonomic factors.

### 2.1 Population and Sample

The researchers utilized simple random sampling in choosing the respondent for the study. The respondents were the teaching and non-teaching personnel of DRTREFI with the following inclusion criteria: have worked for at least one year in the institution and has experienced pain and discomfort in any region of the body in the past two months, and exclusion criteria: trauma/injury in the past 6 months of the study, diagnosed neurological condition, pregnant, six months post-operation. There was a total of 126 respondents, with 52 coming from the teaching population and 74 from the non-teaching population, obtained using a simple random sampling method.

### 2.2 Data and Sources of Data

For this study, secondary data has been collected from the website Google Scholar that allow the researchers to access articles from Jan 2007 to Feb 2024 from various journals that provided necessary information for the formulation of the study.

### 2.3 Theoretical Framework

Sauter and Swanson's theory [5] guides the study, emphasizing the interplay between work organization and physical demands in affecting musculoskeletal strain. Upon understanding these factors, targeted interventions to mitigate WMSDs, improve health, and enhance quality of life can be developed.

## 3. RESEARCH METHODOLOGY

### 3.1 Population and Sample

The researchers utilized simple random sampling in choosing the respondent for the study. The respondents were the teaching and non-teaching personnel of DRTREFI with the following inclusion criteria: have worked for at least one year in the institution and has experienced pain and discomfort in any region of the body in the past two months, and exclusion criteria: trauma/injury in the past 6 months of the study, diagnosed neurological condition, pregnant, six months post-operation. There was a total of

126 respondents, with 52 coming from the teaching population and 74 from the non-teaching population, obtained using a simple random sampling method.

### 3.2 Data and Sources of Data

For this study, secondary data has been collected from the website Google Scholar that allow the researchers to access articles from Jan 2007 to Feb 2024 from various journals that provided necessary information for the formulation of the study.

### 3.3 Theoretical framework

This study was viewed to benefit from Sauter and Swanson's theory[5]. According to this hypothesis, both work organization factors and physical demands of the work were impacted by technologies and the nature of the labor. Workplace organizational characteristics had an impact on physical demands, psychological strain, and biomechanical strain in a direct and indirect manner, respectively. The way labor was organized might have an influence on biomechanical strain by altered posture (physical demands) or muscular tension. The association between biomechanical strain and WMSDs was also expected to be moderated by work organization and individual characteristics.

### 3.4 Instrumentation

Data were collected using two types of questionnaires. A researcher-made questionnaire "Prevalence of Work-related Musculoskeletal Disorder for Teaching and Non-Teaching Personnel of DRTREFI: Basis for Health & Wellness Program Questionnaire (PWMSDTNTP Questionnaire)" and the "Work-related Musculoskeletal Discomfort form" based on the Nordic Musculoskeletal Questionnaire. The researcher-made questionnaire gathered information on demographics that included age, sex, height, weight, BMI, history of MSD and other health conditions, sleeping routine, exercise habits, vices, and number of work hours per day and per week. The work environment, and ergonomics assessment were acquired from the Self-Assessment Checklist & Washington Industrial Safety and Health Act (WISHA) Caution Zone Checklist with a validity and reliability of 0.38-0.93 and greater specificity than sensitivity. The second questionnaire was the "Work-related Musculoskeletal Discomfort form" from the Nordic Musculoskeletal Questionnaire which can be used as an assessment instrument for screening MSDs in an ergonomic context and health care for workers. And is a valid questionnaire used to identify locations of discomfort over the past 12 months and the past seven days [6]. The NMQ has been applied to a wide range of occupational groups to evaluate musculoskeletal problems, including computer and call center workers, car drivers, coopers in the whisky industry, nursing and forestry workers [7]

### 3.5 Statistical tool and econometric models

Frequency count/analysis was used to determine the demographics, environmental factors, ergonomic factors, and musculoskeletal pain patterns. To determine the relationships between variables, the Chi-Square test and Pearson r correlation test were used, where a significant value was set below 0.05.

## 4. RESULTS AND DISCUSSION

### 4.1 Result of demographic profile and pain patterns

| VARIABLE | FREQUENCY | PERCENTAGE |
|---|---|---|
| Age | | |
| 25-30 | 44 | 34.92 |
| 31-35 | 16 | 12.70 |
| 36-40 | 19 | 15.08 |

| | | |
|---|---|---|
| 41-45 | 12 | 9.52 |
| 46-50 | 11 | 8.73 |
| 51-55 | 8 | 6.35 |
| 56-60 | 2 | 1.59 |
| 61-65 | 2 | 1.59 |
| 66-70 | 3 | 2.38 |
| 71-75 | 8 | 6.35 |
| 81-85 | 1 | 0.01 |

**Table 4.1.1 shows the frequency distribution of the age of the respondents**

| VARIABLE | FREQUENCY | PERCENTAGE |
|---|---|---|
| HEIGHT | | |
| 4ft 9in - 4ft 11in | 9 | 7.14 |
| 5ft - 5ft 2in | 57 | 45.24 |
| 5ft 3in - 5ft 5in | 45 | 35.71 |
| 5ft 6in - 5ft 8in | 12 | 9.52 |
| 5ft 9in - 5ft 11in | 3 | 2.38 |

**Table 4.1.2 shows the frequency distribution of height of the respondents**

| VARIABLE | FREQUENCY | PERCENTAGE |
|---|---|---|
| WEIGHT | | |
| 36-40 kg | 1 | 0.79 |
| 41-45 kg | 8 | 6.35 |
| 46-50 kg | 14 | 11.11 |
| 51-55 kg | 45 | 35.71 |
| 56-60 kg | 18 | 14.29 |
| 61-65 kg | 3 | 2.38 |
| 66-70 kg | 23 | 18.25 |
| 71-75 kg | 11 | 8.73 |
| 76-80 kg | 1 | 0.79 |
| 81-85 kg | 2 | 1.59 |

**Table 4.1.3 shows the frequency distribution of the weight of the respondents**

| VARIABLES | FREQUENCY | PERCENTAGE |
|---|---|---|
| BMI | | |
| Underweight | 3 | 2.38 |
| Normal | 53 | 42.06 |
| Overweight | 65 | 51.59 |

| | | |
|---|---|---|
| Obese type 1 | 5 | 3.97 |

**Table 4.1.4 shows the frequency distribution of body mass index (BMI) of the respondents**

| VARIABLE | FREQUENCY | PERCENTAGE |
|---|---|---|
| HISTORY OF MSD AND OTHER HEALTH CONDITION | | |
| No | 109 | 86.51 |
| Yes | 17 | 13.49 |

**Table 4.1.5 shows the frequency distribution having history of musculoskeletal disorders (MSD) and other health conditions of the participants**

| VARIABLE | FREQUENCY | PERCENTAGE |
|---|---|---|
| SLEEPING ROUTINE | | |
| 4-6 hrs | 66 | 52.38 |
| 7-10 hrs | 60 | 47.62 |

**Table 4.1.6 shows the frequency distribution of the sleeping routine of the respondents**

| VARIABLE | FREQUENCY | PERCENTAGE |
|---|---|---|
| EXERCISE HABIT | | |
| 0 x /wk | 1 | 0.79 |
| 1-2 x /wk | 44 | 34.92 |
| 3-4 x/wk | 70 | 55.56 |
| 5 or more x /wk | 11 | 8.73 |

**Table 4.1.7 shows the frequency distribution of the exercise habits of the respondents**

| VARIABLE | FREQUENCY | PERCENTAGE |
|---|---|---|
| VICES | | |
| No | 101 | 80.16 |
| Yes | 25 | 19.84 |

**Table 4.1.8 shows the frequency distribution of vices of the respondents as to drinking and /or alcoholic beverage drinking**

| VARIABLE | FREQUENCY | PERCENTAGE |
|---|---|---|
| # OF WORK HRS. PER DAY | | |
| <8hrs | 44 | 34.92 |
| 8hrs | 67 | 53.17 |
| >8hrs | 15 | 11.90 |

**Table 4.1.9 shows the frequency distribution of work hours per day of the respondents**

| VARIABLE | FREQUENCY | PERCENTAGE |
|---|---|---|
| # OF WORKDAYS PER WEEK | | |
| <5days | 36 | 28.57 |

| | | |
|---|---|---|
| 5 days | 37 | 29.37 |
| >5 days | 53 | 42.06 |

**Table 4.1.10 shows the frequency distribution of the work hours per week of the respondents**

| | Last 12 months | | | Last 12 months (prevented) | | | During the last 7 days | | |
|---|---|---|---|---|---|---|---|---|---|
| | Not answered | No | yes | Not answered | No | yes | Not answered | No | yes |
| Neck | 3 | 63 | 60 | 25 | 90 | 11 | 25 | 83 | 18 |
| Shoulder | 5 | 74 | 47 | 36 | 88 | 2 | 25 | 82 | 20 |
| Elbow | 3 | 108 | 15 | 78 | 45 | 3 | 33 | 89 | 4 |
| Wrist/Hand | 3 | 86 | 37 | 42 | 75 | 9 | 29 | 92 | 5 |
| Upper Back | 3 | 58 | 65 | 39 | 78 | 9 | 30 | 83 | 13 |
| Lower Back | 3 | 55 | 68 | 43 | 71 | 12 | 39 | 56 | 31 |
| One or both hips/thighs | 3 | 85 | 38 | 46 | 75 | 5 | 35 | 80 | 11 |
| One or both knees | 1 | 95 | 30 | 44 | 80 | 2 | 31 | 84 | 11 |
| One or both ankles/foot | 3 | 90 | 33 | 40 | 81 | 5 | 35 | 86 | 5 |

**Table 4.1.11 shows the frequency distribution pain patterns reported by the respondents during the last 7 days to the last 12 months**

A total number 126 teaching and non-teaching personnel within the age group of 25-85 years old, with 75 (59.52%) females participated in this study. Fifty-seven (45.24%) were 5ft-5ft 2 in, 45 (35.71%) weighed 51-55 kg, 65 (51.59%) were overweight, and 109 (86.51%) did not have a history of MSD. For the last 12 months, 68 (53.96%) respondents reported having experienced pain and discomfort in the lower back area, 65 (51.58%) on the upper back, 60 (47.61%) on the neck, 47 (37.30%) on the shoulder, 38 (30.15%) on the hips/thighs, 37 (29.36%) on the wrist/hand, 33 (26.19%) on ankle/foot, 30 (23.80%) on knees, and 15 (11.90%) on elbow. On the other hand, for the past seven days, the lower back (24.60%), shoulder (15.87%), and neck (14.28%) have the highest percentage of reported pain and discomfort.

## 4.2 Result of correlation between demographics profile and musculoskeletal discomfort

| Variable | Areas | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Neck | | Shoulder | | Elbow | | Wrist/Hand | | Upper Back | | Lower Back | | Hips/Thighs | | Knees | | Ankle/Foot | |
| | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value |
| Age | 27.62 | 0.59 | **77.49** | **0.008** | 48.89 | 0.158 | 57.36 | 0.221 | 29.55 | 0.489 | 30.42 | 0.063 | 18.46 | 0.557 | 18.79 | 0.535 | 24.68 | 0.214 |
| Sex | **9.87** | **0.02** | 8.56 | 0.128 | **10.61** | **0.031** | 9.21 | 0.101 | 2.18 | 0.536 | 1.88 | 0.391 | 1.94 | 0.378 | 3.12 | 0.21 | 0.409 | 0.815 |
| Height | 13.04 | 0.366 | **47.17** | **0.001** | **36.11** | **0.003** | 14.43 | 0.808 | 8.87 | 0.714 | 13.31 | 0.102 | 11.93 | 0.155 | 7.31 | 0.504 | 12.86 | 0.117 |
| Weight | **49.19** | **0.006** | **74.26** | **0.004** | **53.53** | **0.03** | **96.04** | **0.000** | **45.42** | **0.015** | **30.68** | **0.031** | 53.42 | 0.000 | **30.94** | **0.029** | **43.32** | **0.001** |
| BMI | 9.36 | 0.404 | 8.79 | 0.888 | 11.37 | 0.498 | 11.37 | 0.498 | 3.07 | 0.961 | 1.86 | 0.932 | 3.55 | 0.737 | 6.83 | 0.337 | 4.75 | 0.576 |
| History of MSD | 2.82 | 0.421 | 4.07 | 0.54 | 2.37 | 0.668 | 7.51 | 0.185 | 0.88 | 0.832 | **6.45** | **0.040** | 0.66 | 0.718 | 0.48 | 0.788 | 0.28 | 0.246 |
| Sleeping Routine | 2.44 | 0.486 | 6.17 | 0.29 | 6.12 | 0.19 | 5.32 | 0.378 | 3.93 | 0.269 | 5.3 | 0.071 | 1.75 | 0.417 | 1.93 | 0.381 | 2.41 | 0.300 |
| Exercise Habit | 5.23 | 0.95 | 26.68 | 0.145 | 13.76 | 0.617 | 26.79 | 0.141 | 19.26 | 0.082 | 13.87 | 0.085 | 3.73 | 0.881 | 3.73 | 0.881 | 13.76 | 0.617 |
| Vices | 1.92 | 0.588 | **40.48** | **0.000** | **18.3** | **0.001** | **27.6** | **0.000** | 2.74 | 0.433 | **6.31** | **0.043** | 2.00 | 0.368 | 1.35 | 0.509 | 0.78 | 0.676 |
| # of Work hrs. per day | 7.66 | 0.264 | 11.81 | 0.298 | 8.65 | 0.373 | 8.47 | 0.583 | **19.75** | **0.003** | 3.31 | 0.507 | 3.14 | 0.534 | 13.6 | 0.009 | 4.03 | 0.403 |
| # of Workdays per week | **22.51** | **0.001** | 12.43 | 0.257 | 10.97 | 0.204 | **25.74** | **0.004** | 11.16 | 0.084 | 8.39 | 0.078 | 5.45 | 0.244 | 9.09 | 0.059 | 6.99 | 0.136 |

**Table 4.2.1 shows the correlation between demographic profile and musculoskeletal pain patterns for the last 12 months**

| Variable | Areas | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Neck | | Shoulder | | Elbow | | Wrist/Hand | | Upper Back | | Lower Back | | Hips/Thighs | | Knees | | Ankle/Foot | |
| | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value |
| Age | 53.52 | 0.000 | 28.08 | 0.107 | 56.66 | 0.000 | 30.3 | 0.065 | 34.13 | 0.025 | 29.74 | 0.074 | 41.7 | 0.003 | 27.73 | 0.002 | 39.27 | 0.006 |
| Sex | 5.32 | 0.07 | 2.09 | 0.353 | 1.00 | 0.607 | 8.92 | 0.012 | 0.844 | 0.656 | 0.74 | 0.689 | 3.82 | 0.148 | 0.005 | 0.545 | 2.84 | 0.242 |
| Height | 19.17 | 0.014 | 19.61 | 0.012 | 17.42 | 0.026 | 72.04 | 0.000 | 12.88 | 0.116 | 14.26 | 0.075 | 36.57 | 0.000 | 12.42 | 0.014 | 16.99 | 0.030 |
| Weight | 24.09 | 0.152 | 16.35 | 0.568 | 20.32 | 0.315 | 32.02 | 0.022 | 28.85 | 0.054 | 28.76 | 0.051 | 11.96 | 0.849 | 12.78 | 0.173 | 34.16 | 0.012 |
| BMI | 8.69 | 0.192 | 14.18 | 0.028 | 10.15 | 0.119 | 11.44 | 0.076 | 21.06 | 0.002 | 24.41 | 0.000 | 16.87 | 0.01 | 17.23 | 0.001 | 16.02 | 0.014 |
| History of MSD | 6.02 | 0.049 | 8.49 | 0.014 | 30.08 | 0.000 | 4.51 | 0.105 | 6.24 | 0.044 | 7.06 | 0.029 | 5.2 | 0.074 | 4.62 | 0.032 | 5.01 | 0.082 |
| Sleeping Routine | 7.46 | 0.024 | 1.9 | 0.387 | 3.86 | 0.145 | 3.53 | 0.171 | 1.14 | 0.567 | 1.32 | 0.518 | 6.24 | 0.044 | 2.19 | 0.19 | 6.44 | 0.040 |
| Exercise Habit | 7.34 | 0.501 | 10.22 | 0.25 | 18.81 | 0.016 | 52.08 | 0.000 | 13.34 | 0.101 | 15.99 | 0.042 | 13.53 | 0.095 | 3.61 | 0.461 | 7.57 | 0.476 |
| Vices | 9.3 | 0.01 | 1.76 | 0.415 | 4.68 | 0.096 | 2.39 | 0.301 | 0.71 | 0.702 | 0.49 | 0.780 | 3.98 | 0.136 | 4.00 | 0.061 | 0.001 | 0.999 |
| # of Work hrs. per day | 11.2 | 0.024 | 7.74 | 0.102 | 3.57 | 0.467 | 10.32 | 0.035 | 4.61 | 0.33 | 3.68 | 0.450 | 4.02 | 0.403 | 2.21 | 0.331 | 6.75 | 0.150 |
| # of Workdays per week | 8.02 | 0.091 | 15.46 | 0.004 | 4.64 | 0.327 | 8.68 | 0.07 | 12.74 | 0.013 | 12.47 | 0.014 | 6.34 | 0.175 | 3.87 | 0.145 | 8.88 | 0.064 |

**Table 4.2.2 shows the correlation between demographic profile and musculoskeletal pain patterns for the last 12 months (prevented)**

| Variable | Areas | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Neck | | Shoulder | | Elbow | | Wrist/Hand | | Upper Back | | Lower Back | | Hips/Thighs | | Knees | | Ankle/Foot | |
| | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value |
| Age | **74.87** | **0.000** | **66.94** | **0.000** | **41.22** | **0.003** | **36.22** | **0.015** | **58.24** | **0.000** | **53.81** | **0.000** | | | **48.07** | **0.000** | **69.09** | **0.000** |
| Sex | 0.029 | 0.985 | **7.37** | **0.025** | **6.33** | **0.042** | **13.36** | **0.001** | 0.946 | 0.623 | 1.18 | 0.555 | | | 2.79 | 0.248 | 0.942 | 0.624 |
| Height | **17.38** | **0.026** | **16.82** | **0.032** | 7.15 | 0.52 | **31.37** | **0.000** | 9.28 | 0.319 | 11.98 | 0.152 | | | 13.95 | 0.083 | **48.72** | **0.000** |
| Weight | **34.09** | **0.012** | 27.69 | 0.067 | 20.16 | 0.324 | 25.87 | 0.103 | 26.51 | 0.089 | 13.66 | 0.751 | | | 18.77 | 0.406 | **49.14** | **0.000** |
| BMI | **17.83** | **0.007** | **33.73** | **0.000** | **21.48** | **0.002** | **19.74** | **0.003** | **31.72** | **0.000** | **28.71** | **0.000** | | | **28.99** | **0.000** | **23.9** | **0.001** |
| History of MSD | **8.15** | **0.017** | 4.06 | 0.131 | 4.41 | 0.066 | 1.49 | 0.473 | **9.6** | **0.008** | **6.41** | **0.041** | | | **6.74** | **0.034** | 4.72 | 0.094 |
| Sleeping Routine | **10.57** | **0.005** | **7.45** | **0.024** | 5.31 | 0.07 | 2.76 | 0.252 | **12.76** | **0.002** | **19.72** | **0.000** | **19.72** | **0.000** | **11.2** | **0.004** | **13.42** | **0.001** |
| Exercise Habit | **29.02** | **0.000** | **23.07** | **0.003** | 4.78 | 0.781 | **17.76** | **0.023** | **17.49** | **0.025** | 12.43 | 0.133 | 12.43 | 0.133 | 11.14 | 0.194 | 5.02 | 0.755 |
| Vices | 5.68 | 0.058 | **10.42** | **0.005** | 1.17 | 0.556 | 1.57 | 0.456 | 4.12 | 0.128 | 4.28 | 0.117 | 4.28 | 0.117 | 3.00 | 0.223 | 4.16 | 0.125 |
| # of Work hrs. per day | 4.2 | 0.38 | **19.44** | **0.001** | **13.55** | **0.009** | **16.29** | **0.003** | 2.77 | 0.597 | **11.06** | **0.026** | **11.06** | **0.026** | **12.92** | **0.012** | 4.79 | 0.309 |
| # of Workdays per week | 1.98 | 0.74 | **9.94** | **0.041** | **10.8** | **0.029** | **10.88** | **0.028** | **14.46** | **0.006** | 6.18 | 0.186 | 6.18 | 0.186 | 9.00 | 0.061 | 4.61 | 0.329 |

**Table 4.2.3 shows the correlation between demographic profile and musculoskeletal pain patterns for the last 7 days**

Chi square test of demographic profile to musculoskeletal discomfort for the last 12 months presented results of the correlation between demographic profile and discomfort (table 5A). Neck discomfort is highly correlated to weight with a p value of 0.006. Shoulder pain and discomfort on the other hand has the highest correlation with height (0.001), weight (0.004), & age (0.008). Other areas of pain and discomfort such as the elbow were correlated with height (0.003). Weight is greatly associated with complaints of discomfort in the wrist/hand (0.000), upper back (0.015), lower back (0.031), knees (0.029), and ankle/foot (0.001). In addition, the respondents' correlation of demographic factors to discomfort experienced in the past 7 days was presented in table 5C. Reports of discomfort are highly correlated with

age (0.000), weight (0.012), height (0.026), BMI (0.007), & history of MSD (0.017). Age is highly correlated with discomfort in the shoulder (0.000), elbow (0.003), wrist/hand (0.015), upper back (0.000), lower back (0.000), knees (0.000), and ankle/foot (0.000). These findings are further supported with previous studies where BMI has a significant impact on musculoskeletal pain and women who are overweight are more likely to get MSK pain [8].

### 4.3 Result of environmental factors and their correlation to musculoskeletal discomfort

| VARIABLE<br>Number of Floors | FREQUENCY | PERCENTAGE |
|---|---|---|
| 1 storey | 10 | 794 |
| 2 storey | 21 | 16.67 |
| 3 storey | 34 | 26.98 |
| 4 storey | 37 | 29.37 |
| 5 storey | 9 | 7.14 |
| 6 storey | 12 | 9.52 |
| 7 storey | 3 | 2.38 |

**Table 4.3.1 shows the frequency distribution of number of floors the building the respondents are working on**

| VARIABLE<br>FLOOR USUALLY WORKING ON | FREQUENCY | PERCENTAGE |
|---|---|---|
| 1st floor | 59 | 46.83 |
| 2nd floor | 45 | 35.71 |
| 3rd floor | 5 | 3.97 |
| 4th floor | 11 | 8.73 |
| 5th floor | 6 | 4.76 |

**Table 4.3.2 shows the frequency distribution of the floor the respondents are usually working on**

**Table 2C. Medium of Transport**

| VARIABLE<br>MEDIUM OF TRANSPORT | FREQUENCY | PERCENTAGE |
|---|---|---|
| Stairs | 89 | 70.63 |
| Elevator | 33 | 26.19 |
| Walk | 1 | 0.79 |
| Not Applicable | 3 | 2.38 |

**Table 4.3.3 shows the frequency distribution of the medium of transport the respondents utilize**

| VARIABLE<br># of Co-Workers | FREQUENCY | PERCENTAGE |
|---|---|---|
| 1-5 | 67 | 53.17 |
| 6-10 | 36 | 28.57 |
| 11-15 | 12 | 9.52 |

**Table 4.3.4 shows the frequency distribution of the number of co-workers respondents have**

| VARIABLE<br>WORKPLACE SHARING | FREQUENCY | PERCENTAGE |
|---|---|---|
| No | 36 | 28.57 |
| Yes | 90 | 71.43 |

**Table 4.3.5 shows the frequency distribution of workplace sharing the respondents have**

| VARIABLE<br>AVAILABILITY OF INSTRUMENTS | FREQUENCY | PERCENTAGE |
|---|---|---|
| No | 123 | 97.62 |
| Yes | 3 | 2.38 |

**Table 4.3.6 shows the frequency distribution of availability of instruments respondents have that aids in their daily tasks at work**

| Variable | Areas | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Neck | | Shoulder | | Elbow | | Wrist/Hand | | Upper Back | | Lower Back | | Hips/Thighs | | Knees | | Ankle/Foot | |
| | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value |
| Number of floors of the work building | 27.77 | 0.066 | **77.35** | **0.000** | 32.47 | 0.116 | **72.26** | **0.000** | 28.29 | 0.058 | 14.51 | 0.270 | 16.29 | 0.178 | 14.36 | 0.278 | 9.23 | 0.683 |
| Floor usually working on | 18.74 | 0.095 | 20.08 | 0.163 | **27.46** | **0.037** | **34.18** | **0.025** | 18.09 | 0.113 | **17.41** | **0.026** | **19.96** | **0.01** | 6.06 | 0.641 | **18.38** | **0.019** |
| Medium of transport from one floor to another | 6.3 | 0.709 | 11.78 | 0.696 | 5.02 | 0.957 | 22.63 | 0.092 | 7.09 | 0.627 | **15.45** | **0.017** | 9.43 | 0.151 | 4.57 | 0.6 | 5.2 | 0.518 |
| Number of co-workers in a shared environment (office) | 21.89 | 0.237 | 31.58 | 0.387 | 26.69 | 0.319 | 25.48 | 0.701 | **29.99** | **0.038** | **21.49** | **0.044** | 20.08 | 0.066 | **28.8** | **0.004** | **32.12** | **0.001** |
| Workspace Sharing | 3.88 | 0.274 | 4.18 | 0.524 | **27.46** | **0.037** | 7.5 | 0.186 | 4.08 | 0.253 | 1.36 | 0.506 | 1.37 | 0.503 | **9.09** | **0.011** | **7.02** | **0.030** |
| Availability of instruments to decrease load and stress | 0.39 | 0.943 | 2.16 | 0.827 | 0.51 | 0.972 | 1.43 | 0.921 | 0.57 | 0.904 | 0.69 | 0.709 | 1.48 | 0.477 | 0.17 | 0.917 | 0.14 | 0.931 |

**Table 4.3.7 shows the correlation between environmental factors and musculoskeletal pain patterns for the last 12 months**

| Variable | Areas | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Neck | | Shoulder | | Elbow | | Wrist/Hand | | Upper Back | | Lower Back | | Hips/Thighs | | Knees | | Ankle/Foot | |
| | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value |
| Number of floors of the work building | 29.18 | 0.004 | 23.83 | 0.021 | 26.5 | 0.009 | 32.24 | 0.001 | 39.41 | 0.000 | 31.54 | 0.002 | 39.51 | 0.000 | 24.96 | 0.000 | 34.53 | 0.001 |
| Floor usually working on | 14.83 | 0.062 | 20.98 | 0.007 | 27.92 | 0.000 | 20.78 | 0.008 | 23.88 | 0.002 | 23.72 | 0.003 | 22.42 | 0.004 | 22.84 | 0.000 | 33.93 | 0.000 |
| Medium of transport from one floor to another | 25.71 | 0.000 | 12.73 | 0.048 | 4.89 | 0.557 | 14.58 | 0.024 | 11.58 | 0.072 | 11.8 | 0.067 | 18.31 | 0.006 | 11.95 | 0.008 | 10.58 | 0.102 |
| Number of co-workers in a shared environment (office) | 12.89 | 0.377 | 19.13 | 0.085 | 21.19 | 0.048 | 37.63 | 0.000 | 17.49 | 0.132 | 21.75 | 0.040 | 17.85 | 0.12 | 15.69 | 0.016 | 17.63 | 0.127 |
| Workspace Sharing | 6.004 | 0.05 | 6.72 | 0.035 | 1.39 | 0.5 | 17.67 | 0.000 | 2.73 | 0.256 | 4.11 | 0.128 | 5.76 | 0.056 | 3.36 | 0.097 | 1.27 | 0.531 |
| Availability of instruments to decrease load and stress | 1.23 | 0.541 | 1.33 | 0.515 | 0.09 | 0.956 | 2.09 | 0.352 | 1.89 | 0.388 | 2.94 | 0.230 | 2.09 | 0.352 | 1.65 | 0.551 | 1.71 | 0.426 |

**Table 4.3.8 shows the correlation between environmental factors and musculoskeletal pain patterns for the last 12 months (prevented)**

| Variable | Areas | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Neck | | Shoulder | | Elbow | | Wrist/Hand | | Upper Back | | Lower Back | | Hips/Thighs | | Knees | | Ankle/Foot | |
| | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value | CS-value | p-value |
| Number of floors of the work building | **64.49** | **0.000** | **40.98** | **0.000** | **27.16** | **0.007** | **44.84** | **0.000** | **60.01** | **0.000** | **36.57** | **0.000** | **42.24** | **0.000** | **41.95** | **0.000** | **33.51** | **0.001** |
| Floor usually working on | **67.39** | **0.000** | **37.2** | **0.000** | **20.36** | **0.009** | **18.69** | **0.017** | **43.99** | **0.000** | **39.65** | **0.000** | **33.19** | **0.000** | **27.41** | **0.001** | **40.22** | **0.000** |
| Medium of transport from one floor to another | **20.31** | **0.002** | **24.48** | **0.000** | **21.41** | **0.002** | **24.64** | **0.000** | **18.96** | **0.004** | 16.58 | **0.011** | **14.53** | **0.024** | **14.16** | **0.028** | **14.47** | **0.025** |
| Number of co-workers in a shared environment (office) | 15.54 | 0.213 | **26.49** | **0.009** | **32.45** | **0.001** | **26.49** | **0.009** | **30.2** | **0.003** | **25.45** | **0.013** | **24.35** | **0.018** | **43.98** | **0.000** | 20.95 | 0.051 |
| Workspace Sharing | **6.31** | **0.043** | 1.006 | 0.605 | **20.36** | **0.009** | 4.91 | 0.086 | 1.45 | 0.485 | 5.59 | 0.058 | **10.92** | **0.004** | 4.77 | 0.092 | **16.22** | **0.000** |
| Availability of instruments to decrease load and stress | 1.59 | 0.451 | 1.65 | 0.438 | 1.28 | 0.528 | 1.14 | 0.567 | 1.59 | 0.451 | 1.59 | 0.510 | 1.77 | 0.413 | 1.54 | 0.464 | 1.43 | 0.489 |

**Table 4.3.9 shows the correlation between environmental factors and musculoskeletal pain patterns for the last 7 days**

The environmental factors that were gathered were the number of floors of buildings the respondents are working on, medium of transport from one floor to another, workplace sharing, & availability of instruments for lifting, reaching, or transporting objects. Results revealed that 37 (29.37%) of the respondents work on a four-storey building, 34 (26.98%) on a three-storey, 21 (16.67%) on a two-storey, 12 (9.52% on a six-storey, 10 (7.94%) on a one-storey, nine (7.14%) on a five-storey, and seven (2.38%) on a seven-storey building respectively. The data further revealed that the medium of transport from one floor to another had more than two-thirds (70.63%) of the respondents stated that they usually use stairs when they are going up or descending the building. In addition, more than four-fifths (91.26%) of the respondents answered that they have between 5 - 15 number of co-workers in their offices. Furthermore, at workplace sharing, it was disclosed that almost thirty 49 percent (28.57%) of the respondents responded

that they have privacy, and they were not sharing things at all in their respective offices, & Availability of Instrument had a 97.62% was gathered from the respondents. A correlation study using the Chi sqaure test revealed that for the past 12 months, number of floors of the work building has the highest correlation to shoulder discomfort with a p-value of 0.000. Floor usually working on, on the other hand, is correlated with pain in the elbow (0.037), wrist/hand (0.025), lower back (0.026), hips/thighs (0.01), and ankle/foot (0.019). Lower back pain is also correlated to the medium of transport from one floor to another with a p-value of 0.017 and number of co-workers in shared environment (0.044). For the past 7 days, a correlational study was also conducted, with shoulder pain being highly correlated to the number of floors of the work building (0.000), floor usually working on (0.000), medium of transport from one floor to another (0.000), and number of co-workers in a shared environment (0.009). Upper extremity, lower and upper back and hips/thigh pain is also similarly correlated to the factors contributing to shoulder pain with p values less than 0.05. Environmental factors, mainly the type of workstation, uncomfortable environment, working posture, and time spent at the workstation, had a huge impact on musculoskeletal pain [9].

### 4.4 Result of ergonomic factors and their correlation to musculoskeletal discomfort

**Table 3. Mean Distribution of Ergonomic Factors**

| VARIABLES | WEIGHTED MEAN | SD | QUALITATIVE DESCRIPTION |
|---|---|---|---|
| Awkward Posture | 3.55 | 0.47 | Agree |
| Stationary Position | 3.48 | 0.43 | Agree |
| Repetition and Duration of Work | 3.27 | 0.38 | Neutral |
| Forceful Motion | 3.2 | 0.68 | Neutral |
| Direct Pressure | 3.2 | 0.43 | Neutral |
| Vibration | 3.33 | 0.75 | Neutral |
| Workplace Set Up | 3.96 | 0.32 | Agree |
| Grand Mean | 3.43 | 0.32 | Agree |

**Table 4.4.1 shows the mean distribution of ergonomic factors**

| Variable | Areas | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Neck | | Shoulder | | Elbow | | Wrist/Hand | | Upper Back | | Lower Back | | Hips/Thighs | | Knees | | Ankle/Foot | |
| | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value |
| Awkward Posture | -0.13 | 0.136 | -0.01 | 0.916 | -0.05 | 0.548 | -0.09 | 0.293 | -0.05 | 0.555 | 0.01 | 0.932 | -0.06 | 0.494 | 0.03 | 0.698 | 0.02 | 0.828 |
| Stationary | -0.01 | 0.938 | -0.02 | 0.802 | -0.17 | 0.061 | -0.14 | 0.129 | -0.12 | 0.192 | -0.05 | 0.089 | -0.06 | 0.491 | 0.07 | 0.439 | -0.02 | 0.833 |
| Repetition | 0.18 | 0.050 | 0.03 | 0.711 | -0.04 | 0.642 | -0.07 | 0.440 | 0.05 | 0.548 | 0.01 | 0.946 | 0.06 | 0.535 | 0.13 | 0.149 | -0.03 | 0.750 |
| Forceful Movement | 0.14 | 0.109 | 0.00 | 0.996 | -0.01 | 0.923 | -0.03 | 0.735 | 0.03 | 0.698 | 0.07 | 0.436 | 0.08 | 0.358 | 0.05 | 0.542 | -0.07 | 0.450 |
| Direct pressure | -0.04 | 0.646 | -0.17 | 0.052 | -0.05 | 0.577 | -0.04 | 0.655 | -0.18 | 0.043 | 0.01 | 0.895 | 0.06 | 0.524 | -0.14 | 0.129 | -0.05 | 0.608 |
| Vibration | 0.13 | 0.142 | -0.02 | 0.788 | -0.06 | 0.526 | 0.03 | 0.777 | 0.02 | 0.792 | -0.04 | 0.679 | 0.06 | 0.480 | 0.07 | 0.427 | -0.09 | 0.337 |
| Workplace | -0.211 | 0.017 | 0.118 | 0.189 | -0.023 | 0.801 | -0.312 | 0.142 | -0.240 | 0.007 | -0.088 | 0.328 | -0.153 | 0.087 | -0.050 | 0.578 | -0.062 | 0.494 |

**Table 4.4.2 shows the correlation between ergonomic factors and musculoskeletal pain patterns for the last 12 months**

| Variable | Areas | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Neck | | Shoulder | | Elbow | | Wrist/Hand | | Upper Back | | Lower Back | | Hips/Thighs | | Knees | | Ankle/Foot | |
| | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value |
| Awkward Posture | 0.01 | 0.907 | 0.08 | 0.373 | -0.02 | 0.797 | 0.04 | 0.648 | 0.10 | 0.281 | 0.14 | 0.122 | 0.17 | 0.060 | 0.16 | 0.075 | 0.14 | 0.106 |
| Stationary | 0.26 | 0.004 | 0.21 | 0.019 | 0.16 | 0.069 | 0.15 | 0.090 | 0.20 | 0.026 | 0.26 | 0.004 | 0.24 | 0.006 | 0.33 | 0.000 | 0.24 | 0.007 |
| Repetition | 0.27 | 0.002 | 0.25 | 0.005 | 0.13 | 0.154 | 0.15 | 0.100 | 0.20 | 0.026 | 0.33 | 0.000 | 0.27 | 0.002 | 0.36 | 0.000 | 0.15 | 0.102 |
| Forceful Movement | 0.18 | 0.045 | 0.27 | 0.002 | 0.10 | 0.262 | 0.15 | 0.103 | 0.16 | 0.075 | 0.24 | 0.007 | 0.16 | 0.072 | 0.21 | 0.020 | 0.05 | 0.573 |
| Direct pressure | -0.07 | 0.441 | -0.10 | 0.284 | -0.02 | 0.814 | -0.11 | 0.223 | -0.20 | 0.023 | -0.10 | 0.264 | -0.10 | 0.244 | -0.18 | 0.039 | -0.20 | 0.024 |
| Vibration | 0.19 | 0.038 | 0.24 | 0.007 | 0.00 | 0.964 | 0.08 | 0.372 | 0.13 | 0.151 | 0.19 | 0.029 | 0.12 | 0.192 | 0.16 | 0.081 | 0.01 | 0.906 |
| Workplace | -0.17 | 0.058 | -0.09 | 0.333 | 0.02 | 0.852 | 0.10 | 0.253 | 0.03 | 0.726 | 0.02 | 0.861 | 0.14 | 0.120 | 0.15 | 0.097 | 0.16 | 0.076 |

**Table 4.4.3 shows the correlation between ergonomic factors and musculoskeletal pain patterns for the last 12 months (prevented)**

Table 6B. Pearson Moment Correlation Test of Ergonomic Factors to Musculoskeletal Pain Patterns for the Last 7 Days

| Variable | Areas | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Neck | | Shoulder | | Elbow | | Wrist/Hand | | Upper Back | | Lower Back | | Hips/Thighs | | Knees | | Ankle/Foot | |
| | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value | r-value | p-value |
| Awkward Posture | 0.10 | 0.247 | 0.10 | 0.248 | 0.20 | 0.024 | 0.17 | 0.057 | 0.13 | 0.136 | 0.23 | 0.010 | 0.16 | 0.077 | 0.27 | 0.003 | 0.19 | 0.032 |
| Stationary | 0.30 | 0.001 | 0.30 | 0.001 | 0.18 | 0.050 | 0.09 | 0.296 | 0.19 | 0.034 | 0.26 | 0.003 | 0.20 | 0.027 | 0.12 | 0.179 | 0.22 | 0.015 |
| Repetition | 0.37 | 0.000 | 0.33 | 0.000 | 0.23 | 0.011 | 0.18 | 0.047 | 0.29 | 0.001 | 0.38 | 0.000 | 0.21 | 0.016 | 0.22 | 0.012 | 0.35 | 0.000 |
| Forceful Movement | 0.18 | 0.041 | 0.21 | 0.018 | 0.12 | 0.175 | 0.11 | 0.202 | 0.24 | 0.007 | 0.25 | 0.005 | 0.11 | 0.220 | 0.12 | 0.178 | 0.16 | 0.075 |
| Direct pressure | -0.18 | 0.047 | -0.09 | 0.306 | -0.13 | 0.144 | -0.17 | 0.056 | -0.14 | 0.114 | -0.07 | 0.464 | -0.18 | 0.039 | -0.21 | 0.020 | -0.23 | 0.011 |
| Vibration | 0.17 | 0.057 | 0.20 | 0.022 | 0.09 | 0.328 | 0.05 | 0.556 | 0.15 | 0.090 | 0.21 | 0.018 | 0.06 | 0.482 | 0.05 | 0.581 | 0.06 | 0.504 |
| Workplace | 0.07 | 0.446 | -0.30 | 0.711 | -0.078 | 0.456 | 0.04 | 0.666 | 0.03 | 0.738 | 0.12 | 0.176 | 0.06 | 0.476 | 0.08 | 0.395 | 0.16 | 0.071 |

**Table 4.4.4 shows the correlation between ergonomic factors and musculoskeletal pain patterns for the last 7 days**

The ergonomic factors consist of awkward posture, stationary position, repetition and duration of work, forceful motion, direct pressure, vibration, and workplace setup. The results showed that both the teaching and non-teaching staff executed poor body mechanics and ergonomics with a weighted mean of 3.55 (SD 0.47) and a weighted mean of 3.48 (SD 0.43) indicating that the staff work in a stationary position. The data revealed that some personnel are not comfortable working, indicating that even though their offices are set up for functionality, they lack comfort. Most on the other hand, respondents are reluctant to share their thoughts regarding other ergonomic aspects such as prolonged and repetitive work, forceful movements, direct pressure, and vibration. Correlation study using the pearson moment correlation test revealed that for the past 12 months, work place set up has the highest correlation to neck pain or discomfort with a p value of 0.017, followed by repetition with a p value of 0.050. Workplace set-up is also correlated to pain and discomfort in the upper back with p value of 0.007. Additional correlational study using the pearson moment correlation test was initiated for pain an discomfort experienced in the past seven days in relation to environmental factors. Results revealed that pain and discomfort in the neck area is correlated with repetition of movement with p value 0.000, stationary position (0.001), forceful movement (0.041) & direct pressure (0.047). Shoulder pain and discomfort is further correlated with

environmental factors with p value below 0.050 such as repetition (0.000), stationary position (0.001), forceful movement (0.018), & direct pressure (0.022). Elbow pain and discomfort is correlated with repetition (0.011), awkward posture (0.024) & stationary position (0.050). In addition, wrist and/or hand pain and discomfort is correlated with repetition of movement with p value of 0.047. Pain and discomfort on other areas of the body and their correlation to environmental factors are presented in table 6A to 6C, with repetition of movement being highly correlated to pain and discomfort experienced in upper back (0.001), lower back (0.000), knees (0.012), and ankle and/or foot (0.000). Repetitive tasks is considered as one of the parameters to be evaluated in the development of Modified Rapid Entire Body Assessment thus, implicating the relationship of repetitive tasks to musculoskeletal disorders [10]. On the other hand, the relationship between stationary positions and work-related musculoskeletal disorder was also revealed as a risk factor[11]. several studies identified force, posture, compression, repetition, duration, vibration, and temperature as physical risk factors for the progress of WMSDs, if present in the long run, could result in decreased blood flow, elongation, compression, tears or strains to muscles, tendons, ligaments and nerves as well as disc or joint damage[12]

**ACKNOWLEDGMENT**

This study was made successful through the significant guidance of the people involved in the completion of this study. The researchers would like to express their deep and sincere gratitude to Mr. Jay Anthony O. Cañete, the dean of the Department of Physical Therapy of the institution, who gave trust to the researchers as well as giving instrumental supervision and encouragement of this study.

To Ms. Ana Jo E. Santos, a great thanks for providing the researchers with invaluable support and tutelage during the entire course of this study.

The researchers are especially indebted to Mr. Alwayne Mercado for sharing his proficiency in statistics, and who actively worked to interpret and analyze the results of the study.

Thanks and appreciation are also given to the respondents of the study who willingly participated in the study.

Most importantly, the researchers give their sincerest thanks to their parents and family, whose love and guidance are with the researchers in whatever they pursue. Lastly, the researchers would like to thank God Almighty.

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