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Experience and Awareness of Musculoskeletal  
Disorders among ETSU Student and Faculty Visual  
Artists

By

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An Undergraduate Thesis Submitted in Partial  
Fulfillment of the Requirements for the  
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Musculoskeletal disorders are a chronic and debilitating issue; these injuries can result in pain and disability that affect daily life and the ability to work in certain careers. To prevent these issues from impacting an individual, it is important to recognize the causative factors of these disorders (Beckle, 2005). Visual artists are no exception to this reality; however, reliable research is scarce regarding this population. The purpose of this study is to examine the level of experience and awareness of visual artists regarding the subject of musculoskeletal disorders and ergonomics within their chosen career field. The hypothesis of this study was that there would be a low level of awareness and a high level in experience of musculoskeletal disorders in the sample population.

## **Background**

### **Work-Related Musculoskeletal Disorders**

Musculoskeletal Disorders are injuries and disorders that affect the human body's movement (this includes muscles, tendons, nerves, etc). G.C. David's in-depth review of Occupational Medicine discusses a wide array of factors contributing to musculoskeletal disorders, including work-related scientific findings (2005). Some careers place individuals at greater risk of developing musculoskeletal disorders due to individual, psychosocial, and physical factors (David, 2005). Although safety varies from occupation to occupation, no workplace is immune from the impact of work-related musculoskeletal disorders (WMSD) (Buckle, 2005). According to the Occupational Safety and Health Administration of the United States Department of Labor, thirty-three percent of American workplace injuries resulted from WMSD (OSHA, 2013). Common musculoskeletal disorders include carpal tunnel syndrome, muscle/tendon strain, tendonitis, ligament sprain, tension neck syndrome, etc (Middlesworth, 2015).

## **Visual Artists**

Visual artists, according to Tad Crawford in his book *Legal Guide for the Visual Artist*, may be “cartoonists, craftspeople, graphic designers, illustrators, painters, photographers, printmakers, sculptors, and textile designers” (Crawford, 2010). Artists are labelled by society as self-less, model-individuals with a Renaissance mentality that denies financial rewards over the authenticity and intent of workmanship (Towse, 1996). Simply stated, artists are independently employed individuals that utilize the upper body’s mechanical movements to portray their passions.

The curriculum of a visual artist at East Tennessee State University (ETSU) is split into three categories: Bachelors of Arts (BA) Studio Art, Bachelors of Fine Arts (BFA) Graphic Design, and BFA Studio Art. Areas of study that would fall under these degrees include ceramics, drawing, extended media, fibers, graphic design, jewelry and metals, painting, photography, printmaking, and sculpture (etsu.edu, 2018). The curriculum for each program of study begins with 1000 level courses related to the area of study and continues through 4000 level courses. Within the College of Arts and Sciences, outside of required classes, the student must complete other graduation requirements, which include a Portfolio Review and a set of training videos concerning chemical hazards and noise damage that could occur within the subject prior to taking the field’s required courses (etsu.edu, 2018).

## **Dental Professionals**

Musculoskeletal disorders are common among dental professionals. A systematic review of the literature reveals that a majority of dental professionals suffer from WMSD within the range of 64 to 93 percent (Hayes, Cockrell, & Smith, 2000). The literature suggests the hands and wrists are the most commonly affected, followed by the back (Hayes, 2009). Valachi and

Valachi discuss strategies to prevent the development of musculoskeletal disorders among dental professionals (2003). They discuss the importance of balanced operator posture and positioning, intensity, and ergonomics (Valachi & Valachi, 2003).

ETSU educates their future dental hygienists regarding the importance of ergonomics and its impact on musculoskeletal health. Within the dental hygiene program's current curriculum is the course "Occupational Safety for Dental Hygiene Care Workers" (etsu.edu, 2018). This course is taken during the first semester of the program to teach habits and procedures to protect students from possible chronic injuries.

### **WMSD Prevention**

Data must be gathered regarding musculoskeletal disorders within a field of work to design prevention strategies for WMSD. The CDC created a seven-step process to assist employers and employees in implementing an evaluation for the management of workplace hazards. Of the seven steps, the first encouraged looking for the indicators of WMSD. The first stage is the assessment stage; this stage involves identifying job duties containing repetitive movements, pain and aches following overnight rest, ergonomic conditions, and more. The first step also focuses on determining the effort indicated for correcting ergonomic problems. Step two involves the planning phase of correcting issues identified in step one. Safety and health programs are considered, along with managerial commitment and identifying the target population of workers that should participate. The third step is implementation; interventions are implemented by educating staff on how to evaluate potential musculoskeletal disorders (Cohen, Gjessing, Fine, Bernard, & McGlothlin, 1997). By applying ergonomic principles through the important step of "identifying and assessing" the ergonomics of the workplace, interventions can be made to reduce exposure to debilitating workplace hazards (OSHA, 2013). Step four analyzes

the data collected through intervention, followed by step five in concluding controls as solutions to the analyzed issues. Step six reviews healthcare policies and procedures. Finally, step seven encourages proactive action towards the ever-changing ergonomic needs of the population at risk (Cohen et al., 1997).

### **Literary Review**

A major issue with scholarly articles and research pertaining to ergonomics and WMSD is the lack of data assembled on visual artists. Investigating ergonomic processes are common among what OSHA defines as “high-risk” industries, such as food handling, construction work, office staff, medical careers, and moving and storage (OSHA, 2013). G.C. David’s analysis of occupational medicine also lists general occupations that have been investigated thoroughly for safety and ergonomics issues (2005). His list included employees from various occupations such as forestry, retail, postal, airport, nursing, manufacturing, health care, shop assistants, bank employees, secretaries, and office workers (David, 2005). Of the lists of occupations, none can be related to the visual artist; thus, ranking the artist’s level of risk as minor and less of a priority.

The level of resources required to perform an ergonomic assessment and training are costly and time consuming (David, 2005). The Centers for Disease Control and Prevention (CDC) maintains David’s assertion, calling the programs for preventing WMSD the most established and expensive among workplaces nation-wide (Cohen et al., 1997). Artists in general work longer hours than most occupations (non-artist related) and yet still receive lower earnings (Towse, 1996). The most likely explanation as to why the visual artist is deprived of protective research, management, training, and evaluation for musculoskeletal disorders is income; hence, these specific self-employed careers don’t have the resources to create a program for the prevention of workplace injury.

Dental hygiene and visual art have a vast array of similarities and differences. The largest connection between the two occupations is the utilization of one's hands and wrists as a major tool for work-related productivity. Artists must be passionate and creative, but their mechanical movements are also important. These movements can be repetitive, like the motions of instrumentation and hand scaling in dental hygiene, continued for extended periods at a time, and/or awkward to the standard of normal range of motion. However, artists do not receive the same training regarding WMSD. Comparing the two curriculums has led the researcher to examine the issue of WMSD among visual artists and what can be done to inform artists of the risks.

### **Purpose**

Understanding the musculoskeletal symptoms of the visual artist can potentially improve the training provided to visual art students and the overall future ergonomic processes and management of painters, sketchers, sculptors, authors, and so forth. The results of this study can be used to develop programs to raise awareness of this issue among artists and programs to teach prevention methods.

### **Methods**

#### **Study Population**

Potential participants included all ETSU faculty in the art department and ETSU students at least 18 years of age who are pursuing a major or minor in art. Those who fell under the exclusion criteria were asked not to participate in the survey. No other exclusion criteria existed. Of the 252 potential participants, 43 completed the online questionnaire.

## **Study Design**

This study was conducted at East Tennessee State University through the online service [surveymonkey.com](https://www.surveymonkey.com). This study used anonymous surveys to gather information regarding experience and awareness of musculoskeletal disorders among visual artists. Since there is little research on this topic, this study was designed to gather baseline data on the topic. This study serves as quantitative research for baseline data. Feedback was recorded in a numerical fashion for each question. Prior to data collection, the study was approved by the ETSU Institutional Review Board (IRB). Potential participants who fit the inclusion criteria were emailed an invitation through the ETSU server on January 30, 2019 by a faculty member of the art department. The email contained a link to the survey via [surveymonkey.com](https://www.surveymonkey.com), allowing faculty and students the chance to participate in recording their personal experience with and awareness of musculoskeletal disorders through a series of questions. Those expressing willingness to continue past the email were forwarded to an online consent form with a detailed explanation of the study. All participants were informed of purpose of the anonymous survey, and that there were no risks or discomforts to be associated with the research. Also, participants were informed of no direct benefits resulting from the research. Confidentiality was assured to be protected as much as possible with the limitations and disadvantages of technology. All identifiable characteristics of an individual were removed from the data. After agreeing to the terms and consent form, participants automatically continued to the research questions. The survey was available for two weeks following the initial recruitment email. Following the first week of administering the survey, 43 students and staff participated. A follow-up reminder email was then sent February 6, 2019. When the survey closed, a total of 45 artists participated in the study.



### **Ergonomic Questionnaire**

The questionnaire contained 33 questions, estimated to take 15 minutes to complete. The online survey included an array of questions about workplace ergonomics, movements, and muscle pains participants may be experiencing. For example, “do you work with computers,” “have you had pain or discomfort in your neck caused by your job.” With the first question being the online consent form, the remaining 32 held a format of 24 multiple choice options and 8 open response questions. Questions 2 through 9 were demographic questions that could be variables associated with the susceptibility to one’s forming musculoskeletal disorders. The following question, 10, asked if the participant knows the definition of a musculoskeletal disorder. Questions 11 through 21 related to musculoskeletal risk factors of the participants. The final portion of the survey, questions 14 through 33, pertained to the experience of musculoskeletal disorders. 29 through 33 pertained specifically to the level of soreness the participants experienced. All questions were administered via surveymonkey.com.

### **Results**

Of the 252 potential participants, 63 of the ETSU visual art faculty and students continued past the email invitation. 60 of the participants agreed to the terms and gave consent to continue onto the questionnaire while 3 did not agree and were excluded from the study. 18 participants did not completely fill out the questionnaire (including the 3 who did not consent), excluding them from the final results, thus 45 participants filled out the entire survey (17.86%). 5 of the questionnaires were completed by faculty (11.11%) while 40 were completed by students (88.89%). Among these two populations, a majority of the respondents identified as female (80%) while the remaining identified as male (20%).

### **Musculoskeletal Disorder Awareness**

Based on the results of the survey, a majority of the participants were unaware of the risk factors associated with musculoskeletal disorders. Prior to the explanation within the questionnaire, 25% of the faculty and 55% of the student population were unaware of the definition of musculoskeletal disorders (Fig 1A). Within this group, 40% of the faculty and 28% of the student population were also unaware of the associated risk factors (Fig 1B).

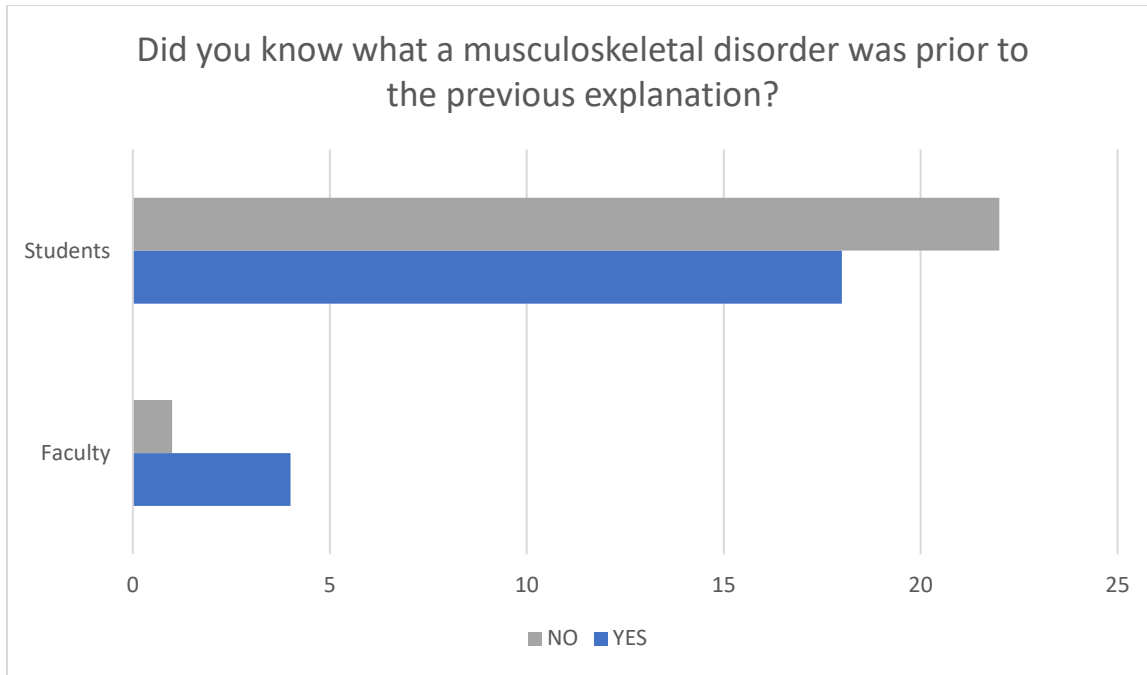
### **Risk Factors Associated with Musculoskeletal Disorders**

Survey responses demonstrate that most participants are exposed to common WMSD associated risk factors. The most common risk factor for both populations (90%) was repetitive movements (Table 3).

### **Musculoskeletal Disorder Experience**

Results of the survey revealed a majority suffered from some degree of debilitating muscle weakness or pain in their neck, shoulder, elbow, wrist/forearm, hand, upper back, and lower back. 63% of contributing faculty and 59% of students experienced pain or discomfort (Table 4). The degree of soreness in 80% of the staff and 81% of the students increased after visual art work. Most faculty (80%) and students (72%) felt muscle aches after and during activities (Table 5). Soreness was reported to interfere at the same level or at an increased level with different aspects in the participants' life for the majority of faculty (63%) and students (55%).

**Figure 1A**



**Figure 1B**

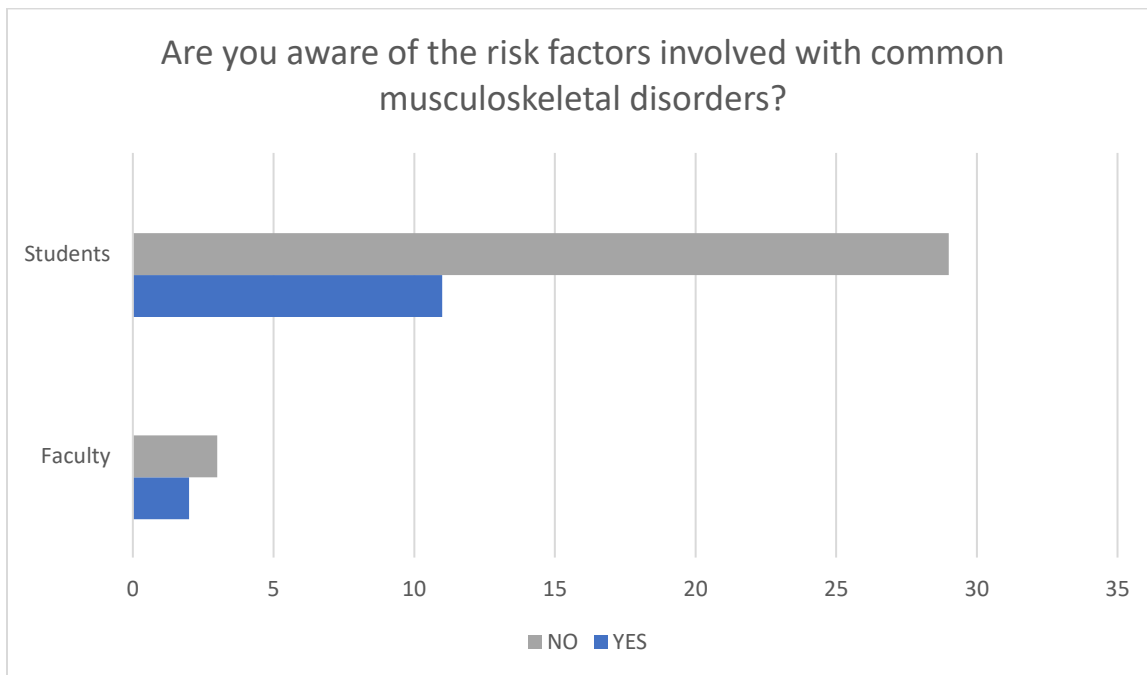


Table 3

|   | Faculty |    | Students |    | TOTAL YES<br>RESPONSES |
|---|---------|----|----------|----|------------------------|
|   | YES     | NO | YES      | NO | %                      |
| <b>13. Do you do the same movement repetitively when doing your artwork (such as repetitive brush strokes)?</b> | 5       | 0  | 34       | 6  | 90.70%                 |
| <b>14. Do you stand while you work?</b>   | 5       | 0  | 26       | 14 | 72.09%                 |
| <b>15. Do you sit while you work?</b>   | 4       | 1  | 33       | 7  | 86.04%                 |
| <b>16. Do you operate with movements at extremely high or low positions for an extended period of time?</b>     | 3       | 2  | 19       | 21 | 51.16%                 |
| <b>17. Do you have to reach an extreme distance for a long period of time?</b>                                  | 3       | 2  | 6        | 34 | 20.93%                 |
| <b>18. Are tasks performed at awkward angles?</b>   | 4       | 1  | 21       | 19 | 58.14%                 |
| <b>19. Do you often handle objects or tools above shoulder height or away from the body?</b>                    | 5       | 0  | 20       | 20 | 58.14%                 |
| <b>20. Do you work with tools?</b>  | 5       | 0  | 29       | 11 | 79.06%                 |
| <b>21. Do you work with computers?</b>  | 5       | 0  | 32       | 8  | 86.05%                 |

Table 4

|   | Faculty |    | Students |    | TOTAL YES<br>RESPONSES |
|---|---------|----|----------|----|------------------------|
|   | YES     | NO | YES      | NO | %                      |
| <b>22. Have you had pain or discomfort in your neck caused by your job?</b>     | 2       | 3  | 24       | 16 | 57.78%                 |
| <b>23. Have you had pain or discomfort in your shoulder caused by your job?</b> | 4       | 1  | 22       | 18 | 57.78%                 |
| <b>24. Have you had pain or discomfort in your elbow caused by your job?</b>    | 2       | 3  | 12       | 28 | 31.11%                 |

|  |   |   |    |    |        |
|--|---|---|----|----|--------|
| <b>25. Have you had pain or discomfort in your wrist/forearm caused by your job?</b> | 3 | 2 | 28 | 12 | 68.89% |
| <b>26. Have you had pain or discomfort in your hand caused by your job?</b>          | 5 | 0 | 27 | 13 | 71.11% |
| <b>27. Have you had pain or discomfort in your upper back caused by your job?</b>    | 3 | 2 | 21 | 19 | 53.33% |
| <b>28. Have you had pain or discomfort in your lower back caused by your job?</b>    | 3 | 2 | 30 | 10 | 73.33% |

**Table 5**

N = no interference; S = some interference, M = most of the time

|   | Faculty |      |       | Students |      |       | TOTAL INCREASES |
|---|---------|------|-------|----------|------|-------|-----------------|
|   | LESS    | SAME | WORSE | LESS     | SAME | WORSE | %               |
| <b>29. While working, is the pain or discomfort...</b>              | 1       | 3    | 1     | 8        | 25   | 7     | 80%             |
| <b>30. After working, is the pain or discomfort...</b>              | 1       | 1    | 3     | 7        | 17   | 16    | 82.22%          |
| <b>Total</b>  | 2       | 4    | 4     | 15       | 42   | 23    | 81.11%          |
|   | N       | S    | M     | N        | S    | M     | SAME/ INCREASE  |
| <b>31. Does the pain/discomfort interfere with your work?</b>       | 2       | 3    | 0     | 15       | 24   | 0     | 60%             |
| <b>32. Does the pain/discomfort interfere with your daily life?</b> | 2       | 2    | 1     | 17       | 23   | 0     | 57.78%          |
| <b>33. Does the pain/discomfort interfere with your sleep?</b>      | 2       | 1    | 2     | 22       | 16   | 3     | 48.89%          |
| <b>Total</b>  | 6       | 6    | 4     | 54       | 63   | 3     | 46.62%          |

### Discussion

The hypothesis that musculoskeletal disorder awareness would be substantially low in our sample population was confirmed by the questionnaire. Although a majority of faculty knew the definition of WMSD, little knowledge of associated risk factors was recorded. Data established

the faculty and students were exposed to major risk factors. Occurrence of pain or discomfort from ergonomic circumstances was common. Pain/discomfort interfered with participants' work, daily life, and sleep at the same or increased level in not only faculty but also students.

The objective of this study was to assess the awareness and the experience of musculoskeletal disorders among visual artists. A convenience sample of ETSU visual artists provided the participants for this study. The sample was allocated into sub-categories, faculty and students, whereby slight group variances between awareness and experience for musculoskeletal disorders were discovered.

WMSD must first be recognized and addressed before action to prevent musculoskeletal disorders can be made. Results showed most faculty members know the definition; yet a large number are unaware of the causative factors of these disorders. Students neither know the definition nor are aware of associated factors. The curriculum does not address proper ergonomic training, leaving students unequipped to recognize and correct habits that could contribute to pain and musculoskeletal disorders.

After the recognition of WMSD issues among visual artists, the first step of the CDC seven-step process can take place. The first step, assessment, looks at the risk factors associated with debilitating disorders. A list was devised of the most significant contributing influences to WMSD among visual artists, including awkward angles, repetitive movements, extremity extension, and other movements. Cited sources, like G.C. David's article, the CDC, and Gehrig's Instrumentation book stress repetition as one of the highest risk factors. According to Matt Middlesworth, preventative school representative, an alternative definition of musculoskeletal disorders is "repetitive motion injury" (2015, p.7). Interestingly, this study found that repetitive movements (such as brush strokes) are very common among visual artists. It is the repetition that

causes the considerable breakdown and regeneration of sarcomeres within the overworked muscles. Consistent breakdown of muscle fibers can lead to deformities and flaws in regeneration, leading to debilitation or weakness (Middlesworth, 2015).

Both dental work and artistry require use of one's hands to accomplish tasks. ETSU dental hygiene students receive training regarding different musculoskeletal disorders and their prevention before scheduling patients. Carpal tunnel syndrome is one of the most common debilitating musculoskeletal disorders (among various others) affecting dental hygienists. Students enrolled in the program are made aware of this syndrome in their first clinical seminar course with the textbook reference *Fundamentals of Periodontal Instrumentation* by author Jill S. Nield-Gehrig. This syndrome is caused by repetitive instrumentation shrinking the carpal tunnel around the median nerve. Pressure and inflammation continue to damage the entrapped nerve, creating numbness and tingling in the hand, wrist, and arm. Other contributing factors include improper grip and size of the tools (Gehrig, 2004).

This survey revealed all visual arts faculty and most students utilize tools for their work. Key signs of carpal tunnel would include muscle weakness in the wrists and hands. The questionnaire shows a majority of staff and students experience pain and discomfort in their hands and wrists. Future studies identifying a correlation between the tools and symptoms of carpal tunnel among visual artists is recommended.

Considering 86% of the respondents claimed to use computers, most also reported that they sit when they do their work, potentially impacting the waist and lower body in ergonomic findings related to pain. The dental hygienist sits when conducting his/her work. ETSU's program trains their graduates to sit with their hips at a ninety-degree angle from their waist. Thighs should be parallel to the floor, requiring the clinician's chairs to be adjustable to the

unique heights of each individual. Not only can the sitting position of an individual impact their hip-region and legs, but the lower back can also be affected. The survey revealed most artists experience pain in the lower back. Further studies should be carried out to see if a correlation between seated positions and musculoskeletal disorders exist among visual artists.

Combined, a majority of both categories felt an increase in pain or discomfort during and after artistic activities. The majority of both populations combined claimed the interference from the pain remained the same and has not increased from work. The lack of increased pain shows the limitations of the study. Outside activities not recorded could contribute to the muscle aches felt by participants, such as other hobbies and activities. Age, gender, weight, experience, etc (although recorded in the survey) could also be contributing factors to pain and discomfort experienced by participants. This study used a convenience sample and a small sample size; therefore, the results are not generalizable to other groups of visual artists. Further research should focus on musculoskeletal disorders in visual artists while controlling for these confounding factors.

### **Conclusion**

In summary, a significant number of ETSU visual artists demonstrate a low awareness of musculoskeletal disorders; however, most are often exposed to the risk factors that contribute to negative muscular consequences throughout their career. Not only is this population unaware of the ergonomic disadvantages, but many of them have a high level of experienced pain and discomfort from their artistic habits that last during and after periods of work. Data from the ETSU students and faculty can be used to design future studies to assist in the recognition, assessment, and diagnosis of musculoskeletal disorders among visual artists, as well as planning



and implementation of interventions to educate and train visual artists in the prevention of musculoskeletal disorders.

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