Implementation of an Office Ergonomic Self-Assessment Checklist for Student Satisfaction in Reducing Risk of Musculoskeletal Associated Disorders

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DNP Project
Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Nursing Practice

St. Catherine University
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May 2021
This is to certify that I have examined this Doctor of Nursing Practice DNP project manuscript written by

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and have found that it is complete and satisfactory in all respects, and that any and all revisions required by the final examining committee have been made.

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May 17, 2021
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DEPARTMENT OF NURSING
Abstract

As the learning platform has moved online for students at a Midwest university, they spend more time using personal computers. Unaware of the association between computer use and musculoskeletal injury, students may not recognize poor ergonomic practices. The project manager implemented a quality improvement initiative to increase first-year Doctor of Nursing Practice (DNP) students’ satisfaction in reducing the risk of associated musculoskeletal disorders.

Seven participants responded to a pre-assessment survey, and 85% reported they had never used an ergonomic self-assessment tool and had not configured their workstations based on recommendations from a professional organization such as the National Institute of Health. The project manager implemented the National Institute of Health’s Computer Workstation Ergonomics: Self-Assessment Checklist to increase ergonomic awareness and guide students in making computer workstation changes. A post-assessment survey revealed that the checklist was implemented and found helpful by 85% of the participants. Therefore, the project results demonstrate student satisfaction with the computer workstation ergonomic self-assessment tool and improve awareness.

Universities should implement the Computer Workstation Ergonomics: Self-Assessment Checklist for all university students. A trained faculty member should be assigned to assist students with equipment and space limitations. Finally, universities should consider an awareness campaign to increase student knowledge of ergonomics and the consequences of poor posture. The campaign should include information about available resources, such as a self-assessment tool, the benefits of proper ergonomics, and the significance of musculoskeletal disorders. Overall, the project is feasible and can provide a significant benefit to university students.

Keywords: computer ergonomics, office ergonomics, home office ergonomics, ergonomic self-assessment, and computer ergonomics-associated musculoskeletal pain
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Introduction

According to the Centers for Disease Control and Prevention (2020), musculoskeletal disorders result in high costs due to missed workdays, lost productivity, increased healthcare, workers’ compensation, and disability claims. In the United States, work-related musculoskeletal disorders account for about 70 million office visits annually and approximately 130 million health care encounters, including outpatient, hospital, and emergency room visits (Centers for Disease Control and Prevention, 2020). It is critical to implement strategies and interventions to decrease work-related musculoskeletal disorder costs.

Due to the current COVID-19 pandemic, remote work and distance learning has become a way of life. While the comforts of home may seem appealing, many people have difficulty creating workspaces in their home environments. Individuals are unaware of how to effectively create a workstation in line with ergonomic standards (University of Nevada, 2020).

Learning has moved online for students at a Midwest university, and they are spending more time at computer workstations in the home. Working in makeshift home offices, students may not recognize poor ergonomics practices, leading to long-term musculoskeletal problems. To address this problem, the project manager recommended a method for students to self-assess office ergonomics to identify and correct poor posture and inadequate equipment set-up. Studies have concluded that self-assessment and participatory intervention approaches are cost-effective and imperative in reducing musculoskeletal disorders among office workers (Albeeli, Tamrin, Guan, & Karuppiah, 2017). This intervention is critical in reducing musculoskeletal pain, lost
production, and long-term or permanent disability (American Industrial Hygiene Foundation, 2020).

The project manager provided a self-assessment checklist to students who spend more than 50% of their day at a computer workstation (Hoe, Urquhart, Kelsall, Zamri, & Sim, 2018). Pertinent components included evaluating the office chair, keyboard, mouse, work surface, time away from the computer, accessories, and laptop use (National Institute of Health, 2020). The effectiveness of the intervention was evaluated by yes or no responses to pre- and post-assessment surveys.

**Theoretical Framework**

Popularizing the term “Theory of Change”, Carol Weiss described the concept as mini-steps leading to a long-term goal (Center for Theory of Change, 2021). Kurt Lewin put this theory into practice by developing Lewin’s 3-Stage Model of Change, a fundamental approach to managing change. While some scholars have criticized Lewin for the oversimplified model, there is merit for its use when the goal is to recognize the need for change and to move towards the desired behavior (Cummings, Bridgman, & Brown, 2016).

Lewin’s 3-Stage Model of Change includes unfreezing, changing, and refreezing (Center for Theory of Change, 2021). To initiate the change process, students recognized the need for change. The primary driving force behind this quality improvement project was for university students to recognize musculoskeletal pain related to ergonomic practices. The student participants were motivated by either preventing the pain or improving current symptoms. The students’ goals of reducing musculoskeletal injury risk provided the opportunity to unfreeze current ergonomic behaviors. Recognition of this stage was participation in the project and
agreeing to make computer workstation adjustments. This stage cannot be successful if participants do not recognize the need for change (Hussain, et al., 2016).

The next stage is most successful when the participant feels empowered to plan and implement the change (Hussain, et al., 2016). Planning occurred by completion of the ergonomic self-assessment checklist. The checklist provided step-by-step instructions to set up a computer workstation. Implementation occurred when the participants made the recommended changes. Finally, they were able to report if a change occurred by completing a satisfaction survey. This stage cannot be successful if there is resistance to change, which can create obstacles and lead to adverse outcomes such as musculoskeletal injury risk (Hussain, Lei, Akram, Haider, Hussain, Ali, 2016).

The final stage involves refreezing the students’ new ergonomic practices. After implementation, the participants completed this stage by reinforcing or stabilizing the computer workstation changes. The intent was to make the changes permanent, and because most participants found the self-assessment checklist tool helpful, this process seemed to occur seamlessly (Burnes, 2020). Permanence requires the participants to discover the benefits of the change. Therefore, this stage was successful as students were motivated by potential pain management or the ability to avoid ergonomics-associated injury (Hussain, Lei, Akram, Haider, Hussain, Ali, 2016).

**Review of Literature**

The need for a computer workstation ergonomic self-assessment and a method to evaluate ergonomic practices is the focus of the evidence presented in this literature review. The project manager accessed Google Scholar, Medline, and CINAHL databases. Keywords and Boolean phrases included: computer ergonomics, office ergonomics, home office ergonomics,
ergonomic self-assessment, and computer ergonomics-associated musculoskeletal pain. The project manager assessed scholarly peer-reviewed English articles published over the past five years. Due to the limited availability of articles related to college students, home offices, and COVID-19, the project manager included articles in various settings and various populations, and there were no terms, settings, or population groups excluded.

**Computer Use and Musculoskeletal Associated Disorders**

Due to the current COVID-19 pandemic, millions of United States residents have been sent home with laptops and little to no equipment or training to prevent ergonomic-associated musculoskeletal disorders (Davis, Kotowksi, Daniel, Gerding, Naylor, & Syck, 2020). Nehar & Sayed (2018) assessed physical workstation characteristics and musculoskeletal dysfunction in computer science students from four institutes and found that students were not aware of proper ergonomics in computer station use. In this study, students from all institutes had a high prevalence of neck pain and low back pain (Nehar & Sayed, 2018).

Rodrigues, Leite, Lelis, & Chaves (2017), determined that inadequate workstation set-up and equipment contributed to musculoskeletal pain in computer office workers. Assessing 38 office workers, the authors suggested a link to the absence of adjustments in chair height, arm and backrests, improper limb postures, and musculoskeletal pain (Rodrigues, Leite, Lelis, & Chaves, 2017). Another study established an association between musculoskeletal symptoms and office work. This study also concluded that delaying ergonomic interventions until musculoskeletal disorders develop is not recommended (Rahman, Awalludin, Masood, & Hassan, 2017).

Osama, Shaukat, & Malik (2018) assessed the development of musculoskeletal discomfort related to posture and computer use. They determined that posture, duration, and type
of computer were risk factors for postural pain. The authors also concluded that corrected posture could reduce musculoskeletal discomfort (Osama, Shaukat, & Malik, 2018). Another study involved researchers in Karachi who concluded that musculoskeletal pain among computer users is much higher compared to other countries. Because most computer users did not have ergonomically designed workstations, the authors described the need to adopt policies like those of the Occupational Safety and Health Administration (OSHA) (Khan, Asif, Chughtai, Rajput, & Khalfe, 2017).

**Ergonomics Assessment Tools**

Currently, few studies have assessed computer workstation ergonomic assessment tools. Rahman & Mohamad (2017) conducted a review on seven observational methods for determining exposure to office work-related musculoskeletal disorders. The authors found several gaps in knowledge and that no existing tool covered all risk factors, including working posture, office components, force, repetition, and office environment (Rahman & Mohamad, 2017). Focusing primarily on working posture, none of the tools covered the office environment as a risk factor (Rahman & Mohamad, 2017). This information provides the opportunity to improve methods for assessing ergonomic risk factors with computer use.

D’Silva, Cote, Murphy, & Barakat-Haddad (2017), conducted a pilot study evaluating the effectiveness of the Student Laptop Use and Musculoskeletal Posture (SLUMP) questionnaire. The web-based assessment tool measures ergonomic exposure during laptop use in university students (D’Silva, Cote, Murphy, & Barakat-Haddad, 2017). While the checklist developed by the National Institute of Health is specific to computer desktop use, it includes components such as the use of a laptop stand to allow for making workstation adjustments with laptop use. However, the SLUMP questionnaire pilot study demonstrates the importance of implementing an
appropriate tool to measure posture during laptop use (D’Silva, Cote, Murphy, & Barakat-Haddad, 2017). The research also reflects a more significant improvement in satisfaction when the tool is modified to meet the individual’s needs (D’Silva, Cote, Murphy, & Barakat-Haddad, 2017).

Osama, Ali, and Malik (2018) used a Student Specific Cornell Musculoskeletal Discomfort Questionnaire to assess posture discomfort during computer use. This study evaluated ergonomic awareness, posture when sitting on chairs, and the type of computer used. The questionnaire helped determine the frequency of poor posture (Osama, Ali, & Malik, 2018). Rodrigues, Leite, Lelis, & Chavis (2016), used the Rapid Upper Limb Assessment (RULA) to assess the postural load requirements and demands on the neck, trunk, and upper extremities during computer use. This observational tool was helpful for experts to evaluate posture during computer use. However, it was not beneficial as a self-assessment tool (Rodrigues, Leite, Lelis, & Chavis, 2016).

The information obtained by the literature review revealed the need for a self-assessment tool. With limited reviews of specific assessment tools, the checklist, developed by the National Institute of Health, Division of Occupational Health and Safety, was selected for this project. The Computer Workstation Ergonomics: Self-Assessment Checklist is helpful by providing step-by-step instructions for workstation set-up to provide optimal comfort. The National Institute of Health developed this tool based on research demonstrating how appropriate posture can help prevent a variety of musculoskeletal conditions (National Institute of Health, Division of Occupational Health and Safety, 2015).
**Project Implementation**

The project manager selected the Computer Workstation Ergonomics: Self-Assessment Checklist developed by the National Institute of Health (2020) for project implementation. The project aimed to improve university student satisfaction of reducing musculoskeletal disorder risk. Seven students participated in the project and met the following criteria: full-time DNP students spending at least five hours four days a week on a computer and agreeing to make computer workstation adjustments based on the checklist.

**Pre-Assessment Survey**

Participants completed a 5-question Pre-Assessment Office Ergonomic Questionnaire. The survey’s purpose was to assess prior ergonomic assessment tool use, current workstation space and equipment, and satisfaction with current ergonomic practices. Additionally, the survey helped students recognize the need to unfreeze current practices, such as poor workstation configurations.

**Ergonomic Self-Assessment Tool**

The participants completed the National Institute of Health’s Computer Workstation Ergonomics: Self-Assessment Checklist (National Institute of Health, 2020). The project manager provided the self-assessment checklist to help the students change ergonomic practices by correcting poor posture at home or work office computer workstations. The checklist offers 24 assessment items, including office chair, keyboard, mouse, worksurface, breaks, accessories, laptop, and desk sharing components. Each component lists multiple yes, no, or N/A questions and provides suggested actions for negative responses. The self-assessment also provides photo demonstrations for posture, monitor angle, and work area set-up (National Institute of Health, 2020).
**Post-Assessment Survey**

The student participants completed a 4-question Post-Assessment Office Ergonomic Questionnaire. The survey’s purpose was to determine if participants used the self-assessment tool, if they configured their workstation based on the checklist, and if students were satisfied with the new ergonomic practices. Additionally, the survey helped students recognize the potential benefits of the change and the need to stabilize or refreeze the latest methods. Finally, the results were compared to the post-assessment survey to determine if the tool increased satisfaction in reducing the risk of associated musculoskeletal disorders.

**Evaluation**

Implementing the office ergonomic self-assessment checklist increased student satisfaction in reducing musculoskeletal risk. Seven students from a Midwest University participated in the project. An analysis was conducted by the project manager using a closed-ended questionnaire measuring yes and no responses from seven participants in a pre-assessment and post-assessment. There were five questions in the pre-assessment and four questions in the post-assessment.

**Pre-Assessment**

Response percentages for each of the pre-assessment survey questions are in Table 1. The evidence suggests that most sample users have not configured computer workstations because they are not familiar with office ergonomic assessment tools. Over 57% of students reported having a designated workspace that includes a desk, chair, and laptop or desktop, while almost 43% reported not having designated space. Only one student reported prior self-assessment tool use and was the only participant to report being satisfied with the ability of current ergonomic practices in reducing the risk of musculoskeletal disorders.
Table 1

*Pre-Survey Results*

<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Total Responses</th>
<th>Total Yes</th>
<th>Total No</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you currently or have you ever used an office ergonomic assessment tool?</td>
<td>7</td>
<td>1</td>
<td>6</td>
<td>14.29%</td>
<td>85.71%</td>
</tr>
<tr>
<td>2. If so, was it helpful?</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>14.29%</td>
<td>0.00%</td>
</tr>
<tr>
<td>3. Do you have a designated workspace that includes, at a minimum, a desk, chair, and laptop or desktop?</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>57.14%</td>
<td>42.86%</td>
</tr>
<tr>
<td>4. Did you configure your workstation based on office ergonomic recommendations provided by a professional organization, such as the National Institute of Health?</td>
<td>7</td>
<td>1</td>
<td>6</td>
<td>14.29%</td>
<td>85.71%</td>
</tr>
<tr>
<td>5. Are you satisfied with the ability of your current ergonomic practices in reducing the risk of musculoskeletal disorders?</td>
<td>7</td>
<td>1</td>
<td>6</td>
<td>14.29%</td>
<td>85.71%</td>
</tr>
</tbody>
</table>

**Post-Assessment**

Table 2 demonstrates the response percentages for each of the post-assessment survey questions. The evidence suggests that users were satisfied with the ability of the new ergonomic practices in reducing musculoskeletal disorders. All participants reported that they used the office ergonomic self-assessment checklist tool and found it helpful. All but one respondent reported that they configured their workstation and were satisfied with the ability to reduce musculoskeletal disorders.
Table 2

*Post-Survey Results*

<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Total Responses</th>
<th>Total Yes</th>
<th>Total No</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you use the office ergonomic self-assessment checklist tool?</td>
<td>7</td>
<td>7</td>
<td>0</td>
<td>100.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>If so, was it helpful?</td>
<td>7</td>
<td>7</td>
<td>0</td>
<td>100.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Did you configure your workstation based on the self-assessment checklist tool</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>85.71%</td>
<td>14.29%</td>
</tr>
<tr>
<td>recommendations?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After completing the checklist, are you satisfied with the ability of your</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>85.71%</td>
<td>14.29%</td>
</tr>
<tr>
<td>current ergonomic practices in reducing the risk of musculoskeletal disorders?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Discussion**

Working in an office environment is strongly associated with musculoskeletal disorders due to poor ergonomic practices (Singh & Singh, 2018). This project demonstrates that six out of seven (85.71%) participants were not working at a workstation that meets ergonomic standards. The large percentage may be due to the sudden transition to home computer use due to the COVID-19 pandemic for the project participants. However, according to the 2016 American Community Survey, it is evident that there has been a steady increase in the duration of computer use among office workers and households in the United States since 1984 (United States Census Bureau, 2018). Therefore, it is imperative to address ergonomics and computer use to reduce the risk of musculoskeletal disorders.
When completing the self-assessment tool, participants made the recommended changes to their computer workstations and responded positively. While the sample size was small, the respondents’ percentages represent approximately 25% of the current student cohort with 85.71% positive responses. However, larger sample sizes are an essential consideration in determining the tool’s effectiveness.

The National Institute of Health’s Computer Workstation Ergonomics: Self-Assessment Checklist is most useful when users have available space, furniture, and equipment required for workstation set-up. However, the checklist offers suggested actions to modify items or items to obtain (National Institute of Health, 2020). If the user does not have a designated space for workstation set-up or cannot get the necessary furniture and equipment, the checklist will not be helpful. For example, the tool will not help a student using only a laptop and kitchen table or couch.

A tool such as the Student Laptop Use and Musculoskeletal Posture (SLUMP) questionnaire will be most beneficial for laptop users, primarily when used in conjunction with a laptop-specific checklist or tip sheet. The SLUMP tool can accurately measure ergonomic exposures related to laptop use. The questionnaire is clear and straightforward and can help students identify factors leading to poor posture (D’Silva, Cote, Murphy, & Barakat-Haddad, 2017). Knowing these factors, students can access various laptop tip sheets, web pages, or checklists to assist with maintaining posture to reduce musculoskeletal strain. For example, Indiana University offers a webpage that includes tips such as using reams of paper to raise the laptop monitor (Indiana University, 2019).
Limitations

The literature and project evidence demonstrates the need for ergonomic self-assessments for computer users, whether in the home or workplace. However, this project includes a small sample size of 7, limiting the ability to consider variables such as preexisting musculoskeletal or other health conditions. Additionally, the participants were from one homogenous class, limiting the external validity of the results.

Conclusion

The literature review describes the need to address ergonomic-associated musculoskeletal disorder risk factors, and the evidence shows the value of adequate computer workstations in reducing risk. The literature and evidence also demonstrate the lack of ergonomic awareness and ergonomics assessment tool use. Results of this project suggest that university students who used the National Institute of Health’s Computer Workstation Ergonomics: Self-Assessment Checklist found it helpful and were satisfied in reducing musculoskeletal disorder risk. Researchers can further investigate outcomes specific to university students in home settings.

Recommendations

University management should implement the Computer Workstation Ergonomics: Self-Assessment Checklist developed by the National Institute of Health for all students. The project site can implement a computer workstation self-assessment tool with elements that allow for space and equipment limitations to promote sustainability. At a minimum, the tool should include the office chair, keyboard and mouse, work surface, breaks, accessories, and use of a laptop or desktop computer. The project site managers can address space and equipment
limitations by including tips such as using reams of paper to raise the laptop monitor height in the assessment tool (Indiana University, 2018).

Space and equipment limitations can present challenges for workstation set-up. Therefore, universities should assign faculty members to assist students struggling with workstation set-up. All faculty, or a minimum of the assigned members, should receive computer workstation ergonomic training. An opportunity for training is available from the Occupational Safety and Health Administration (OSHA). OSHA offers a Computer Workstation eTool that is interactive and illustrated web-based training tool (OSHA, 2021).

Universities should consider an awareness campaign to increase student knowledge of ergonomics and the consequences of poor posture. The campaign should include information about available resources, such as a self-assessment tool, the benefits of proper ergonomics, and the significance of musculoskeletal disorders. Increasing awareness can motivate students to prevent injuries that may result in long-term disability (OSHA Education Center, 2020).

Overall, the project is feasible and can provide a valuable benefit to university students. To maintain the program and its benefits, the program administrators should consider the following:

- Identify priorities such as stakeholder engagement, communication, training, and management.
- Connect with university leaders for financial and administrative support.
- Engage faculty, staff, and students by discussing the program’s relevance and its benefits.
- Provide ergonomics training to university faculty and staff.
- Advertise the program and its benefits every term. Offer rewards to participants.
- Recruit students to support program administration and to receive ergonomics training.
- Develop a communication protocol that includes continuous feedback from stakeholders.

- Hold regular meetings and dialogue to encourage involvement in program development and sustainment.

- Evaluate effectiveness with pre- and post-assessment surveys at least annually.

- Shift program characteristics to meet the needs of students, faculty, and staff.

- Re-evaluate.
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