Computer Use and Musculoskeletal Symptoms Among Post-Secondary Students: A Critical Review

Katherine Buckley, Eleni Levreault, Katrina Merner
Interdisciplinary School of Health Sciences, University of Ottawa

Abstract

Background: Previous studies have shown an association between computer use and musculoskeletal symptoms (MSS). Over the last decade, there has been a significant increase in computer use among post-secondary students.
Objective: This review aims to explore the relationship between computer use and MSS in post-secondary students.
Methods: A structured literature review was conducted to examine the association between computer use and MSS in post-secondary students. Keywords included musculoskeletal symptoms, musculoskeletal pain, undergraduate students, graduate students, laptop use and computer use.
Results: Eight peer-reviewed studies were appraised and included in the review. A relationship between computer use in post-secondary students and MSS was found in all eight studies.
Conclusion: The literature supports the relationship between computer use in post-secondary students and MSS. Future directions for study will be discussed.

Introduction

Working with computers for long periods of time can lead to muscle fatigue and discomfort in the upper extremities [1]. Indeed, previous studies have shown an association between computer use and musculoskeletal symptoms (MSS) [2].The risk for developing MSS, and subsequently musculoskeletal disorders (MSDs) increases as one's use of computers and laptops increases. MSS can include numbness or tingling in affected areas, stiffness or reduced range of motion, tenderness and swelling, and pain with or without movement [3]. Risk factors for MSS and MSDs from computer use consist of sitting in fixed positions for long periods of time, repetitive movements, and little or no breaks while working [1].

Over the last decade, there has been a significant increase in computer use among post-secondary students, especially since more and more post-secondary courses are computer-delivered [4,5]. As such, the post-secondary student population may be more vulnerable to experiencing MSS and MSDs as a result of increased computer and laptop use. Thus, this review aims to explore the relationship between computer use and MSS in post-secondary students.

Research Question: Are post-secondary students at risk for developing musculoskeletal symptoms related to computer and laptop use?

Methods

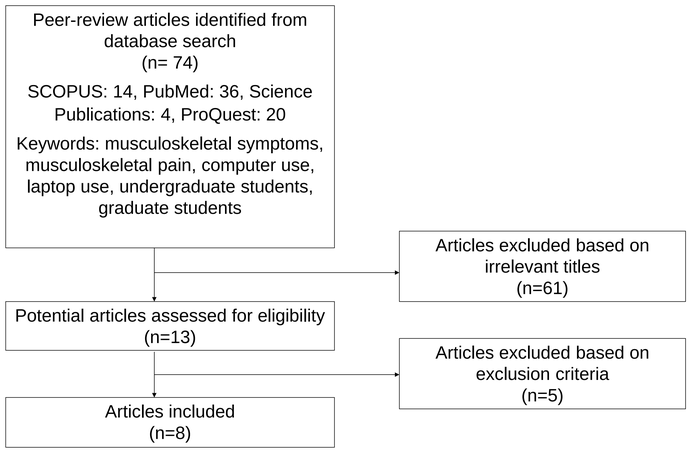

Figure 1. Methodology of structured literature review. Inclusion criteria consisted of post-secondary students, laptop use, peer-reviewed, and prevalence of MSS. Studies focusing on technology other than laptops and desktops were excluded and populations other than post-secondary students were excluded. Rater agreement (k) = 1.

Results

Author (Year)	Sample	Methods	Results
Menedez et al., 2009 [6]	Graduate students N = 166 (USA)	Cross-sectional study	• 55% of students reported upper extremity pain with computing 2 weeks prior • Lead to limitations in academic work • Some students reported using medication and healthcare services • Regions with highest prevalence of pain: neck (62%), wrists (52%) and shoulders (50%) • Number of years in school where computer use was >10hr/week ↑ likelihood of reporting pain within 1 hr of computer use (OR=1.56, 95% CI 1.04- 2.35)
Chang et al., 2007 [7]	N = 27 (USA)	Prospective pilot study	• 96% reported MSS of any severity at least once • Most symptomatic body parts: neck (48%), lower back (44%), upper back (40%), shoulders (37%) • >3hr computer usage ↑ likelihood of MSS (OR =1.5, 95% CI = 1.01-2.25)
Hupert et al., 2003 [4]	N = 194 (USA)	Cross-sectional study	• 42% had upper extremity pain in 2 weeks prior • 67% experienced pain in either neck, shoulders, arms, wrists or fingers after working on computer • 41% reported at least one functional limitation • 23% used medications for upper extremity pain or discomfort and 16% saw a healthcare provider for pain or discomfort
Kanchanomai et al., 2011 [8]	N= 2,511 (Thailand)	Cross-sectional study	• 30.9% reported MSS in the spine in prior 3 months (partly or solely attributed to computer use) • Sites of symptoms: cervical (22.3%), thoracic (11%), and lumbar (10.7%) • Prevalence of thoracic pain was significantly higher in 4th year students than 1st year (adjusted OR = 2.81, 95% CI= 1.67-4.72)
Obembe et al., 2013 [9]	N = 376 (Nigeria)	Cross-sectional study	• 91% of laptop users reported MSS • Most common areas of pain or discomfort: right shoulder (17.1%), left shoulder (16.3%) and the neck (15.6%)
Rajagopal et al., 2012 [10]	N =170 (USA)	Cross Sectional Study	• 88% reported MSS after or during computer use
Jenkins et al, 2007 [11]	N = 116 (USA)	Cross-sectional study	• 54% of students reported upper extremity pain with computer use • 62% experienced upper extremity functional limitations • 16% reported MSS affect academic performance • 27% used medications for upper extremity pain or discomfort and 15% saw a healthcare provider for pain or discomfort • Regions with highest prevalence of pain: neck (72%), shoulder (56%), and wrists (51%)
Dockrell, Bennett & Culleton-Quinn, 2014 [12]	N=241 (Ireland)	Cross sectional study	• 52.8% of students reported computer-related MSS • Neck and upper back were the most frequently reported sites of discomfort • Prevalence of computer-related MSS was associated with year of college (fourth year students OR= 2.88, 95% CI= 1.27-6.52 and first year OR=1.28, 95% CI=0.59-2.77). • MSS impacted work (18.3%), leisure (23.6%), and 17.1% reported MSS resulted in need to seek medical attention.

Table 1. Summary of results of selected articles from structured literature review.

Discussion

Primary Findings:
- All studies reviewed reported a high prevalence of MSS in the samples studied; therefore, we conclude there is a relationship between computer use and MSS in post-secondary students.

Secondary Findings:
- The body regions with highest prevalence of MSS were the neck, shoulders, and wrists
- Three studies found that reporting of MSS increased with advancing year of study
- The reporting of MSS increases with increased duration of computer use
- Several studies found students who experienced MSS reported functional limitations in various aspects of life such as school, leisure, and work
- MSS may also require students to use medication or access health care services

Limitations:
- Seven of the eight studies were cross-sectional, which are low on the hierarchy of evidence
- Results based on self-reports from study samples could lead to response bias
- Structured literature review is less rigorous than a systematic review
- We only included studies in English and excluded studies on MSS in the work place; thus, we were only able to incorporate eight studies relevant to the research question

Contextualization:
- The findings in this study are consistent with the literature on workplace health and safety:
  - -- 10% of Canadians reported repetitive strain injury in 2001, mostly caused or aggravated by the work place [13]
  - -- Ontario's Ministry of Labour reports that risk for MSS increases as intensity of computer use increases [1]
  - -- Prolonged computer use leads to discomfort most often in the neck, shoulders, upper and lower back regions [14].

Conclusion

- According to this structured literature review, post-secondary students are at risk for developing musculoskeletal symptoms related to computer and laptop use.
- Future research should investigate:
  - -- The applications of ergonomics on post-secondary campuses (ie. libraries, study rooms, lecture halls)
  - -- Longitudinal studies exploring the socioeconomic impact of MSS on computer users (ex. health care costs, social participation, work days lost)
  - -- Impact on musculoskeletal health in later life (ex. development of osteoarthritis, etc.)

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