



# Computer use and musculoskeletal symptoms among undergraduate university students



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## ARTICLE INFO

### Article history:

Received 30 May 2014

Received in revised form

30 January 2015

Accepted 2 February 2015

Available online 11 February 2015

### Keywords:

Post-secondary education

Laptops

Desktops

Musculoskeletal symptoms

## ABSTRACT

The use of computers has been shown to have the potential for detrimental effects on the musculoskeletal system. Previous research has identified risk factors for computer-related musculoskeletal symptoms (MSS) in the workforce, but the focus of investigation on university students is comparatively recent. There appears to be a relative paucity of research into computer-related MSS in European universities and none to date in Ireland. The primary aim of this study was to determine the prevalence of computer-related MSS in a cohort of undergraduate university students in Ireland. The cross-sectional study design involved a questionnaire of two parts. Part A was a questionnaire adapted from previously used questionnaires and included questions relating to demographic information regarding age, gender, year of study, hand dominance and details of computer use. Part B was a modified (to include only computer-related symptoms) Nordic Musculoskeletal Questionnaire. A total of 312 Health Sciences students were surveyed and 241 responded, giving an overall response rate of 76.9%. All students used a computer, with 95.4% using a laptop. Although the reported duration of computer use was quite low, the prevalence of computer-related MSS was high (52.8%). Increased prevalence of MSS was significantly associated with year of college, average daily laptop use and right hand dominance. A considerable proportion of students reported that MSS impacted on their work (18.3%) and leisure activities (23.6%) and furthermore 17.1% sought medical attention. The current study suggests that further research should be carried out on students from other disciplines and on students in other European universities to facilitate a greater understanding of the risk factors for computer-related MSS in undergraduate students.

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## 1. Introduction

The use of computers is an inherent part of people's everyday lives, and students are no exception (Kobus, Rietveld, & van Ommeren, 2013). As well as the personal and social use of technology, most colleges and universities now provide desktop computers or require students to have a laptop for their academic work. In many cases, students are permitted or required to use a laptop during class (Gaudreau, Miranda, & Gareau, 2014). The use of computers has been linked with musculoskeletal symptoms (MSS), although causal relationships between computer use and specific upper limb conditions have not yet been established (Waersted, Hanvold, & Veiersted, 2010). Previous research has identified risk factors for computer-related MSDs in the workforce, such as daily time spent using a computer (Bergqvist, Wolgast, Nilsson, & Voss, 1995; Blatter & Bongers, 2002; Gerr, Marcus, & Monteilh, 2004; Jensen, Ryholt, Burr, Villadsen, & Christensen, 2002); female gender (Jensen et al., 2002); posture (Eltayeb, Staal, Hassan, & de Bie, 2009; Gerr et al., 2004); and psychosocial factors (Eltayeb et al., 2009; Haufler, Feuerstein, & Huang, 2000). These relationships have been investigated for many years among the workforce, but the focus of investigation on university students is relatively recent. It is not yet clear if the risk factors for students are the same as those of the workforce. The age profile may be different between the two groups. The workstations may also differ as the workplace is regulated by

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legal standards whereas the students' educational and personal environments are not. A pilot study by [Jacobs et al. \(2011\)](#) considered the influence of the workstation on discomfort among university students. Their findings suggested that the use of an adjustable chair or a riser in combination with educational training may have been beneficial in reducing the incidence of musculoskeletal discomfort during notebook computer use. [Kanchanomai, Janwantanakul, Pensri, and Jiamjarasrangsri \(2012\)](#) in a survey of undergraduate university students reported an increase in experience of musculoskeletal symptoms in the cervical spine and thoracic spine in participants who reported that they perceived that their keyboard was too high.

The patterns of computer use among university students are not that well established, but evidence from studies in the US suggests that students are spending considerable lengths of time using computers. Eighty-two percent (82%) of students in a study by [Hamilton, Jacobs, and Orsmond \(2005\)](#) reported that they spend up to 6 h/day on a computer, with almost 28% reporting that they spent 4–6 h/day computing. [Menéndez et al. \(2008\)](#) found that 17% of students estimated they used a computer daily for 6–8 h. The type of computer that students use has also been considered. [Noack-Cooper, Sommerich, and Mirka \(2009\)](#) reported that 52% used only desktop computers and 4.3% used only a laptop. [Smith, Salaway, and Borreson Caruso \(2009\)](#) described how the proportion of students who own a laptop has been increasing over time. [Hamilton et al. \(2005\)](#) found that desktop computers were used for longer (50% of time) compared to laptops (15.3% of time).

The earliest study to investigate the prevalence of computer-related MSS in university students found that over 53.4% of students reported having experienced computer-related upper limb musculoskeletal symptoms ([Katz et al., 2000](#)). Similar US studies, based largely in private colleges, have also found relatively high prevalence rates of symptoms ranging from 42% to 80% ([Hamilton et al., 2005](#); [Hupert et al., 2004](#); [Jenkins et al., 2007](#)). A study conducted at a university in Thailand reported a lower incidence of 30.9% ([Kanchanomai et al., 2012](#)). Despite the differing prevalence rates, due partly to the different definitions of musculoskeletal symptoms used, two risk factors for the association between computer use and musculoskeletal symptoms for students have been quite consistent across the studies: (i) being female ([Hupert et al., 2004](#); [Jenkins et al., 2007](#); [Kanchanomai et al., 2012](#); [Katz et al., 2000](#); [Noack-Cooper et al., 2009](#)); and (ii) number of hours computing time ([Jenkins et al., 2007](#); [Kanchanomai et al., 2012](#); [Katz et al., 2000](#)).

The impact of computer-related musculoskeletal symptoms has also been investigated. Functional impairment was reported by 62% of students ([Jenkins et al., 2007](#)), 23% used medication and 16% had seen a health care professional ([Hupert et al., 2004](#)). Computer-related musculoskeletal symptoms in students may potentially be a precursor to future events in the workplace, particularly at a time of increasing computer use. Given that there is a paucity of research in this area on European students, and none to date in Ireland, this study was conducted to investigate the prevalence of MSS in a cohort of university students in Ireland. The primary aim of the study was to determine the prevalence of computer-related MSS in undergraduate university students. The objectives were (i) to investigate the pattern of computer use, (ii) to establish the prevalence and the impact of computer-related MSS, and (iii) to determine the strength of the relationship if any, between demographic and computer-related factors and MSS.

## 2. Method

### 2.1. Research instrument

In keeping with previous studies the prevalence of MSS was based on subjective reports of symptoms. The study design involved a survey using a questionnaire comprised of two parts. Part A was a questionnaire adapted from previously used questionnaires ([Jacobs & Baker, 2002](#); [Katz et al., 2000](#); [Schlossberg et al., 2004](#)) and included questions relating to demographic information regarding gender, year of study, hand dominance and details of patterns of computer use. The students were asked if they use a laptop and/or a desktop computer. If they did, they were asked "How long on average per day would you spend using it?" (<0.5 h; ≥0.5 h–<1 h; ≥1 h–<2 h; ≥2 h–<4 h; ≥4 h–<6 h; ≥6 h). They were also asked "How long do you usually spend on the computer at any one time, without taking a break?" (<0.5 h; ≥0.5 h–<1 h; ≥1 h–<2 h; ≥2 h–<4 h; ≥4 h–<6 h; ≥6 h). Part B was a modified Nordic Musculoskeletal Questionnaire ([Kuorinka et al., 1987](#)) and focused on computer-related symptoms only. [Violante, Isolani, and Raffi \(2000\)](#) emphasized the necessity to distinguish between musculoskeletal disorders (MSD) that include both signs (based on objective clinical examination) and symptoms (based on subjective reporting) and musculoskeletal symptoms, which include only symptoms. For the purpose of this study, a computer-related musculoskeletal symptom (MSS) was self-reported and was defined as "the presence of trouble (ache, pain, discomfort)" ([Kuorinka et al., 1987](#)) that was caused by and/or aggravated by use of a computer". The latter part of the definition was included in an attempt to identify the "computer-relatedness" of the symptoms. The 3-month prevalence of MSS in nine body regions including neck, shoulders, elbows, wrists/hands, upper-back, lower-back, hips/thighs, knees and ankles/feet ([Kuorinka et al., 1987](#)) was investigated. In advance of data collection, a pilot study was conducted on a convenience sample of 10 university students who were not potential participants. Minor amendments regarding questionnaire design and the clarification of questions were made.

### 2.2. Participants

The participants for the study included a convenience sample of undergraduate Health Sciences students. The students were eligible for inclusion if they were Physiotherapy (PT) or Occupational Therapy (OT) students at Trinity College, Dublin, and were age 18 or more. Five physiotherapy and three occupational therapy research assistants who were involved in the administration of the study were excluded.

### 2.3. Procedure

Permission was granted by the Heads of Discipline of Physiotherapy and Occupational Therapy at Trinity College, Dublin, to conduct the research among the undergraduate students. The PT students were surveyed in February 2011 and the OT students were surveyed in October 2011. Initial contact was made by a gatekeeper through e-mail, inviting students to participate, with details of the study and a participant information leaflet attached. Seven days later a research assistant approached each year group at the end of a lecture to distribute hardcopy questionnaires to the students and provide further information on the study. This method of questionnaire distribution was chosen as

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