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The University of Dublin

STAYING WELL AT YOUR COMPUTER: COMPUTER USE AND COMPUTER- RELATED MUSCULOSKELETAL SYMPTOMS IN UNIVERSITY STAFF DURING COVID-19

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Executive Summary

Introduction

This report is based on the findings of a survey conducted in a challenging time during the COVID-19 pandemic (March 2021). Trinity College Dublin staff were instructed to conduct their work from home, in accordance with public health measures used to help stop the spread of COVID-19. The survey sought information about computer use, computer-related workstations, and computer-related musculoskeletal symptoms (MSS) in university staff working from home or on site on the university campus, in the previous 3 months.

Computer use has been linked to the development of MSS, with poor work practices, work environments and working postures considered to be key risk factors. The requirement for all staff to work from home during the COVID-19 pandemic created unique circumstances where the computer-related work practices of the university community could be explored, with an emphasis on the exploration of remote working. The researchers sought to investigate the physical characteristics of the onsite and remote computer workstations, and the prevalence of computer-related MSS among staff.

Survey Method

An online anonymous survey was conducted using a 39-item questionnaire. The questionnaire consisted of 4 sections: (i) computer use; (ii) other activities; (iii) demographics; (iv) musculoskeletal symptoms. The questionnaire was based on the widely used Nordic Musculoskeletal Questionnaire, and other questions that have been previously used in the literature.

Once completed surveys were returned, the data were analysed using descriptive statistics such as frequencies, central tendency, and variability, with associations tested using Chi-square analysis.

Summary of Key Findings

- The majority (63.6%; n=665) reported they worked from home all the time
- Only 2.7% (n=28) reported they worked onsite at the university all the time
- Respondents reported that computers were used for longer durations at home than they were onsite at the university
- A laptop was more frequently used, and was used for a greater number of hours at home than onsite at the university
- 52% reported they had a dedicated home office or workspace

- Computer equipment was more likely to be used onsite at the university than at home
- The comfort of the workspace was reported to be greater onsite at the university compared to home
- Eighty-three percent (83%) of respondents reported computer-related MSS.
- Over eighty percent (82.2%) reported MSS related to laptop use and 64.6% reported MSS related to desktop use
- The most frequently reported body areas were neck (75.6%), shoulder (69.7%), and lower back (57.5%)
- The prevalence of laptop-related MSS was significantly higher than desktop-related MSS for the neck, shoulder, and lower back
- There was an association between MSS and gender. Respondents who were female were more likely to report computer-related MSS
- There was an association between MSS and handedness. Respondents who were righthanded were more likely to report computer-related MSS
- There was an association between equipment use at home and MSS. There was a lower prevalence of MSS (laptop or desktop) associated with the use of an office chair, desk, and monitor, but not with a keyboard or a mouse. There were no significant associations between equipment use and MSS onsite at the university
- Computer-related symptoms resulted in a reduction in non-work-related activities (35%), work activities (18%) and seeking medical attention (24%).

Key Recommendations

Following the analysis of the data, the research identified two key areas where interventions should be made to reduce the risk of computer-related MSS in the future in those working in the university workspace and those engaged in hybrid working, which incorporates a home workspace.

- **Addressing the prevalence of MSS among staff**
Addressing the fact that a large proportion of the respondents reported computer-related MSS needs to be prioritised. However, considering the subject matter of the survey, there may have been self-selection bias, whereby potential study respondents with a computer-related MSS were more likely to complete the survey than those who did not. Possible interventions include the following: (i) provision of an education resource regarding strategies to minimise the risk of MSS when using a desktop computer or a laptop computer, (ii) ensuring that

workstation design is suitable in both the university and home workspace, and (iii) using the considerable evidence and guidance available to inform an audit of onsite and remote workstations and (iv) an awareness campaign to promote safer working at computers in the future.

- Improving workstation comfort

Possible interventions to improve comfort at the workstation include the following: (i) provision of appropriate computer equipment (including office chair, desk, monitor, keyboard, and mouse) for both the university and home workspace, (ii) education of staff regarding the importance of maintaining a comfortable computer workstation, and the importance of taking regular breaks.

Key Findings at a Glance

PARTICIPANTS' PROFILE

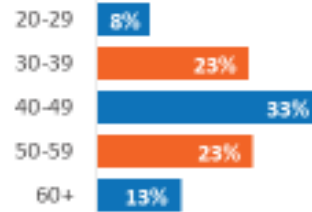
GENDER



HANDEDNESS



AGE



ROLE

| | |
|--------------------------|-----|
| Administration | 42% |
| Academic | 32% |
| Research Fellow/Post doc | 12% |
| Research Assistant | 5% |
| Technical Officer | 3% |
| Others | 6% |

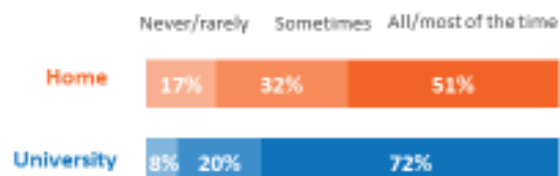
WORKING DURING COVID-19

PLACE OF WORK

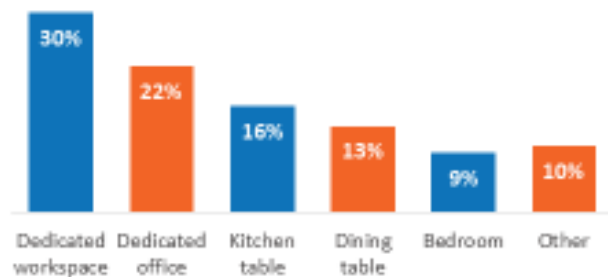


COMFORT OF THE WORKSPACE

Respondents felt more comfortable at the university than home.

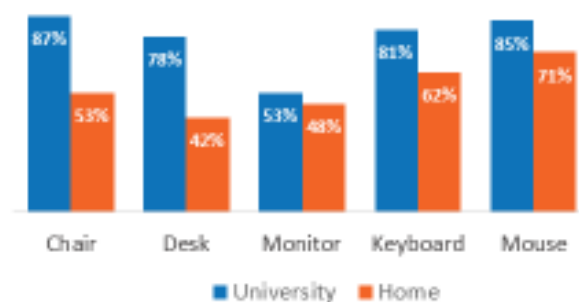


USUAL WORKSPACE AT HOME



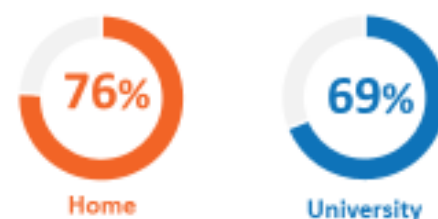
USE OF EQUIPMENT

More respondents had access to an office chair, desk, keyboard and mouse in the university compared to the home.



TAKE BREAKS

More respondents took breaks from computer use when working at home compared to when working in the university.



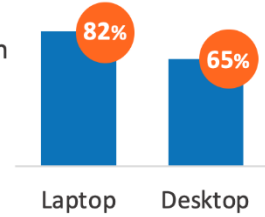
COMPUTER-RELATED MSS

HIGH LEVEL OF MSS

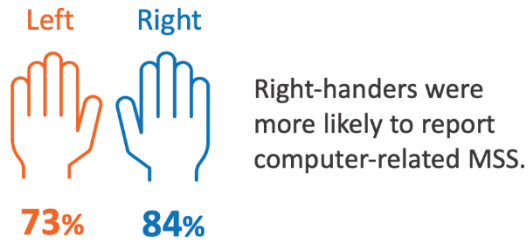


MSS AND TYPE OF COMPUTER

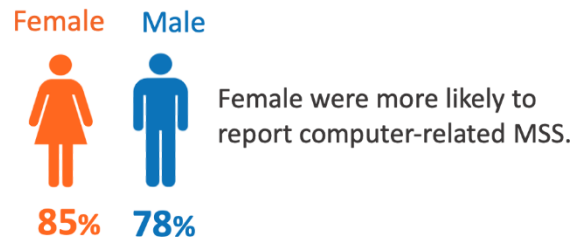
MSS was associated with laptop use more than desktop use.



MSS AND HANDEDNESS

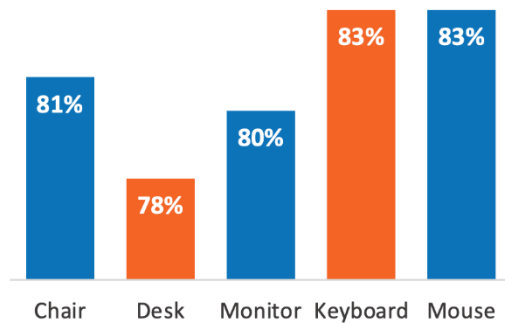


MSS AND GENDER



MSS AND LACK OF EQUIPMENT AT HOME

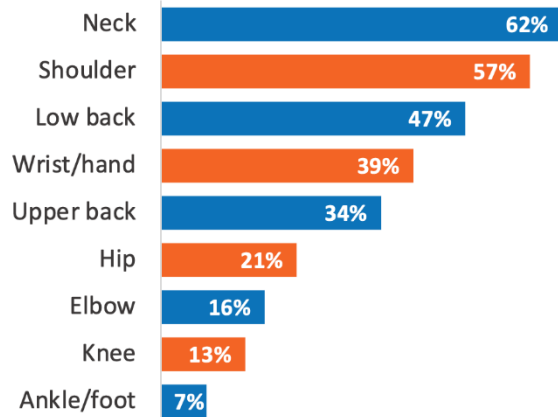
A lower prevalence of MSS was associated with the use of an office chair, desk and monitor, but not with a keyboard or a mouse.



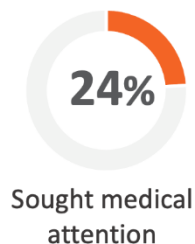
MSS AND LESS COMFORT AT HOME



MSS BY BODY PART



IMPACT OF MSS



Authors

Dr Sara Dockrell is an Assistant Professor in the Discipline of Physiotherapy, School of Medicine, Trinity College Dublin and a CORU registered Chartered Physiotherapist. The key direction of her research is the investigation and application of ergonomics to promote physical health and well-being in both children and student populations in education, and adults in the workplace. Her research outputs have been collaborative and have been used to influence best practice guidance in healthcare and for the public.

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The authors would like to acknowledge the TCD College staff who engaged with and participated in the study. Their additional feedback was greatly appreciated. We would also like to acknowledge the support from the Secretary's Office at TCD who assisted in the distribution of the survey. Finally, we would like to acknowledge the invaluable input and research support from Tam Nguyen.

1. Introduction

1.1. Background

The use of computers has increased exponentially in all aspects of our lives in recent times. Computer use has been linked to the development of musculoskeletal symptoms (MSS). The prevalence and risk factors for computer-related musculoskeletal disorders (MSD) or symptoms (MSS) in employees have been explored in the literature for some time (Waersted et al., 2010) (Feng et al., 2021) with work practices, work environment (Ye et al., 2017) and working postures (Eltayeb et al., 2009) considered to be key risk factors. Much of the research is carried out on employees in office environments, but there is limited research on computer-related MSS in persons who are working from home. Additionally, there is limited research on those working in the higher education sector, many of whom also frequently work in a hybrid model, away from their usual workplace environment, even under normal non-COVID-19 conditions.

In March 2020, the requirement to work remotely became mandatory for employees in many sectors, including the higher education sector. This was in keeping with public health advice to help stop the spread of COVID-19. At short notice, employees were instructed to conduct their work from home. The requirement for all staff to work from home during the COVID-19 pandemic created a unique situation to explore the computer-related work practices of the college community. The researchers sought to investigate the physical characteristics of onsite and remote computer workstations, and the prevalence of computer-related MSS among the staff.

This report is based on the findings of a survey conducted in a challenging time (March 2021) during the COVID-19 pandemic. The survey sought information about computer use, computer-related workstations, and computer-related musculoskeletal symptoms (MSS) in university staff working from home or on site at the university campus in the previous 3 months.

1.2. Structure of the Report

This report is presented in the chronological order in which the process of the study occurred. The study method is described in section 2. Details of the study participants are presented in section 3. The results of the survey are provided in section 4. The conclusions and recommendations from the report are in section 5.

2. Methodology

This study was a cross-sectional online anonymous survey.

2.1. Questionnaire design

The questionnaire used in the survey contained 39 questions, 33 of which were closed-ended questions, and consisted of 4 sections: computer use; other activities; demographics; musculoskeletal symptoms (Appendix 1). Section 1 was related to the pattern of computer use and was based on questions used in previous studies (Katz et al., 2000) (Jacobs & Baker, 2002) (Schlossberg et al., 2004) (Dockrell et al., 2015). Section 2 enquired about participation in sport and playing a musical instrument, as some are known risk factors for musculoskeletal disorders. Section 3 sought demographic information from the respondents. Section 4 was a Nordic Musculoskeletal Questionnaire (Kourinka et al., 1987), modified to enquire about musculoskeletal symptoms in the ***past 3 months*** and to include ‘pins and needles’ in the definition of musculoskeletal discomfort. For the purposes of this study a computer-related musculoskeletal symptom was defined as ***‘any ache, pain, discomfort, pins and needles or numbness associated with your use of a laptop or desktop computer’***.

2.2. Participants

Participants were recruited from the staff of Trinity College Dublin. All staff working at the institution at the time of the study were included except for the researchers (n=2) who were members of the academic staff. All participants were 18 years of age or older. Staff who did not use a computer were excluded.

2.3. Procedure

The survey link to the Qualtrics^{XM} survey platform, along with a participant information leaflet (PIL), was sent by the college Secretary’s Office to all staff on the college mailing lists in March 2021. Subsequently, after seven days a thank you/reminder email was sent. Ethics approval to conduct the study was granted by the School of Medicine Research Ethics Committee of the university. Submission of a completed questionnaire was considered as consent.

2.4. Data analysis

The data were categorical in nature and the analysis and presentation of the data predominantly involved descriptive statistics such as frequencies and measures of central tendency and variability. Associations between variables were investigated using a Chi-square test. Statistical analysis was completed using Statistical Package for Social Sciences (SPSS v.27) (IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp). Statistical significance was set at $p < 0.05$.

The analysis was based on 1045 responses, but not all questions were required to be answered by all respondents. For example, if a respondent reported that they do not use a desktop computer, all subsequent questions relating to desktop use and desktop-related MSS would not be applicable to the respondent. Additionally, some questions were not answered by all respondents, but their data from other questions were still retained for analysis. For example, for the question 'What Faculty/Administrative area are you in?' the analysis was based on $n=890$ responses. The number of respondents upon which the analysis is based is provided in cases where all respondents were not included in the analysis.

3. Survey Participation/Respondents

3.1. Response rate

A total of 1121/6651 responded, giving a response rate of 16.8%. Seventy-six ($n=76$) surveys were incomplete and excluded from the analysis. The analysis was based on 1045 responses. The overall response was relatively low, but there was good representation from all areas, staff description, age, and gender.

3.2. Demographics of the respondents

Section 3 of the questionnaire requested demographic information from the respondents. The full breakdown of the responses is shown in Figures 1-5.

In summary, the sample comprised:

- 68% female respondents (Figure 1)
- a range of age categories (Figure 2)
- 90% right-handed respondents (Figure 3)
- respondents from all Faculties and Administrative Areas (Figure 4)
- 42% of respondents from Administration (Figure 5)

Figure 1. Gender

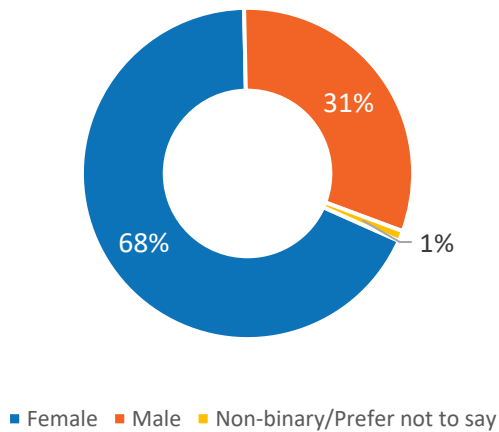


Figure 2. Age (n=1022)

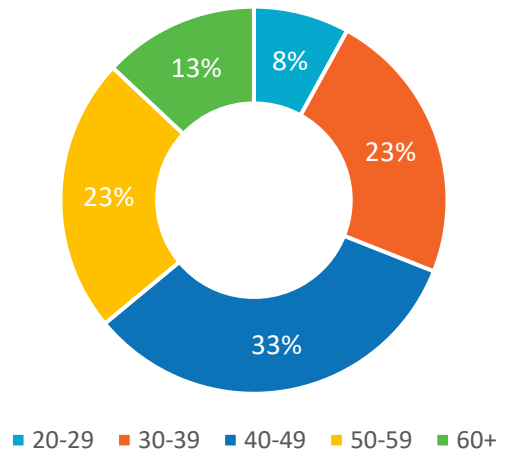


Figure 3. Handedness (n=1018)

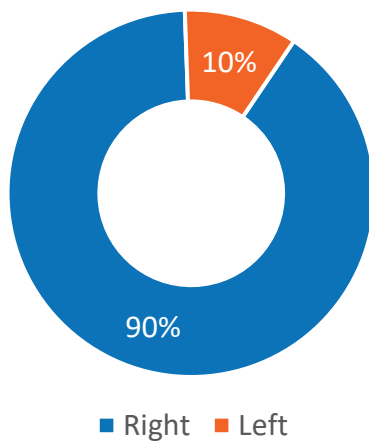
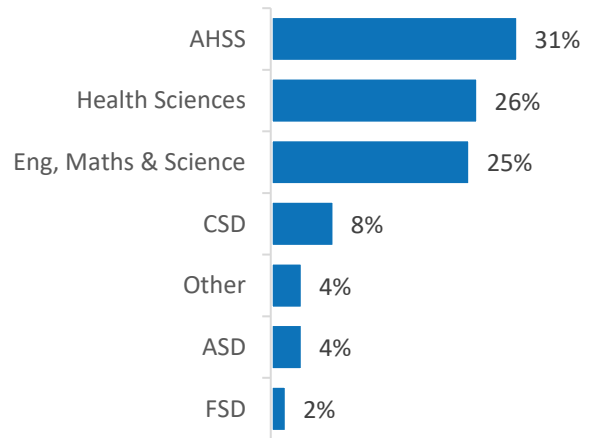
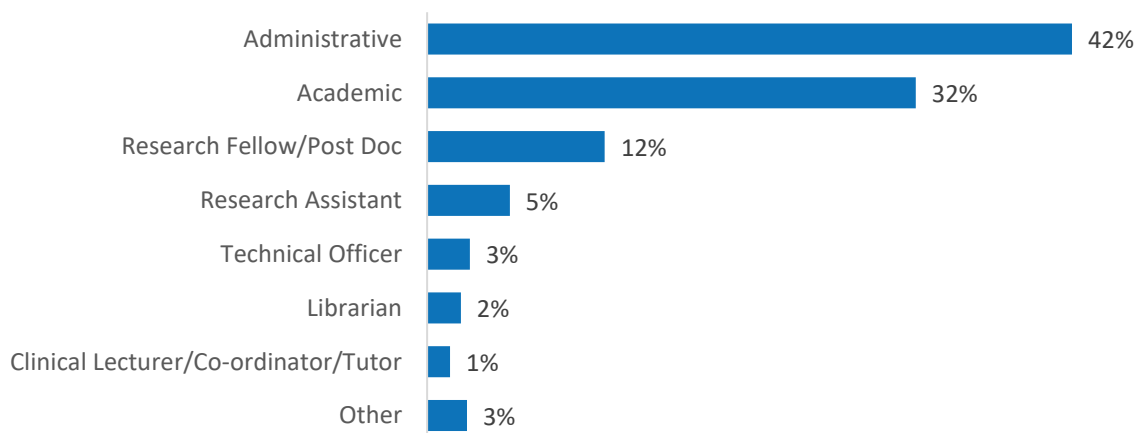


Figure 4. Faculty (n=890)



AHSS - Arts, Humanities and Social Sciences
 CSD – Corporate Services Division
 ASD – Academic Services Division
 FSD – Financial Services Division

Figure 5. Staff Description (n= 1019)



4. Survey Findings

The findings of the survey are presented in this section. The majority of the 39 items in the questionnaire were closed-ended, for ease of response (n=33; 85%). For closed-ended questions a binary response was expected for some questions (n=12), whereas in others there were a greater number of choices (n=19) or a Likert-type scale (n=2).

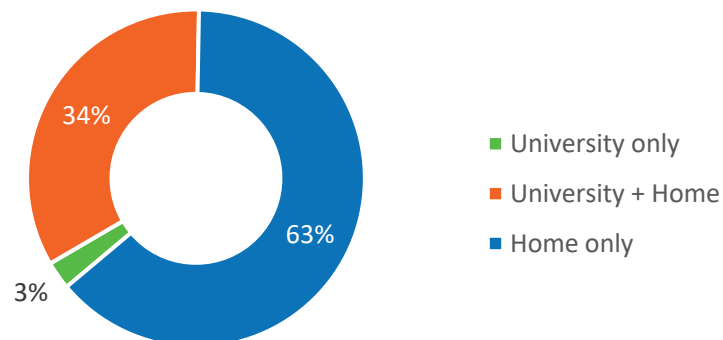
4.1. Working during COVID-19

4.1.1. Place of work

Participants were asked about the proportion of their time spent working at their home or onsite university workspace during the past 3 months. Figure 6 shows the findings for those working solely at home or in university, and for those who worked between the two workspaces during the COVID-19 pandemic.

- The majority (63%) of respondents worked from home only
- 34% worked at home as well as at their university workspace
- 3% worked at their university workspace only

Figure 6. Place of work in past 3 months



4.1.2. Working environment

Respondents were asked about their usual workspace when working at home (Figure 7) or in their onsite university workspace during the past 3 months (Figure 8).

- The majority (82%) of those who worked onsite in the university worked in an office workspace.

- Of those who worked at home (n=1013):
 - 30% worked at a 'dedicated working space'
 - 22% worked in a 'dedicated home office'
 - 16% worked at the kitchen table
 - 13% worked at the dining table
 - 9% worked in a bedroom
 - 10% worked in other

Figure 7. Usual workspace at home (n= 1013)

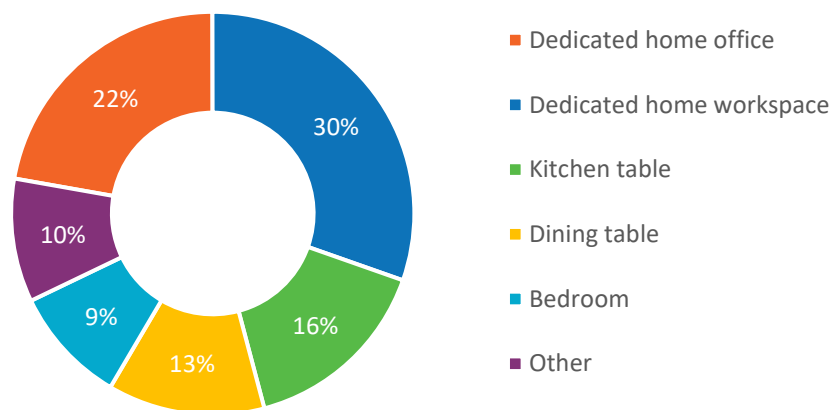
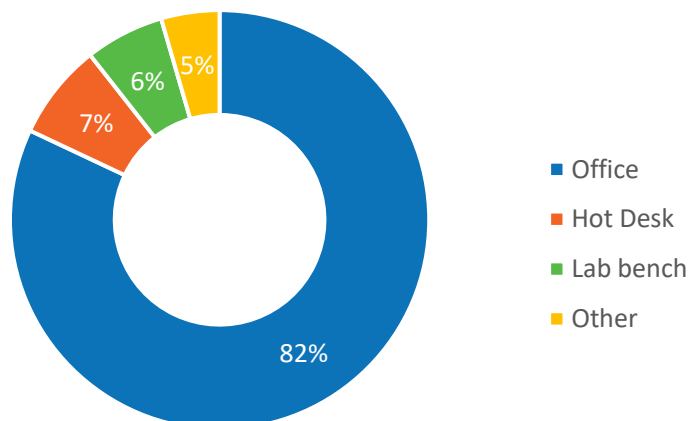


Figure 8. Usual university workspace (n=379)

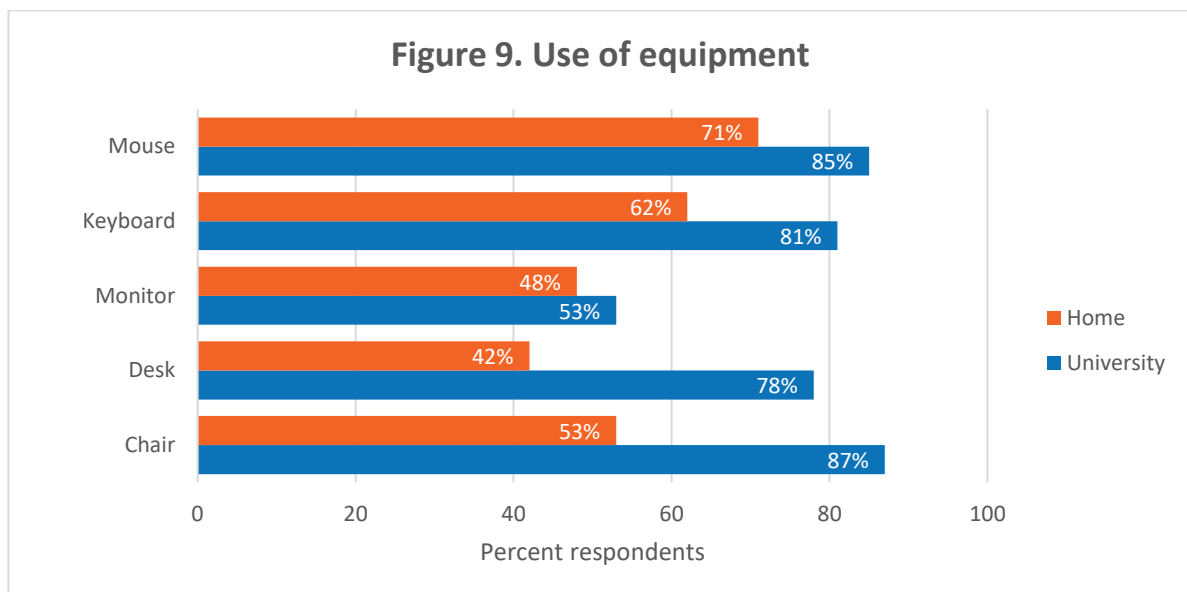


4.1.3. Computer workstation furniture and equipment

Respondents were asked about the usual workspace, furniture, and the equipment they use when working from home or in their university workspace in the past 3 months

Significantly more respondents had access to an office chair, desk, keyboard, and mouse in the university workspace compared to the home workspace ($p < 0.05$). There was no significant difference regarding access to a monitor. The results are presented in Figure 9.

- 87% had a dedicated office chair in the university; 52.6% had a dedicated office chair at home ($p < 0.05$)
- 85.5% used a mouse in the university; 71.4% did so when working at home ($p < 0.05$)
- 78.4% had a dedicated office-type desk in the university; 42.5% had a dedicated office-type desk at home ($p < 0.05$)
- 81% had a keyboard in the university; 61.9% had a keyboard when working at home ($p < 0.05$)
- 53.2% had a monitor, compatible with their laptop in the university; 47.8% had one when working at home.



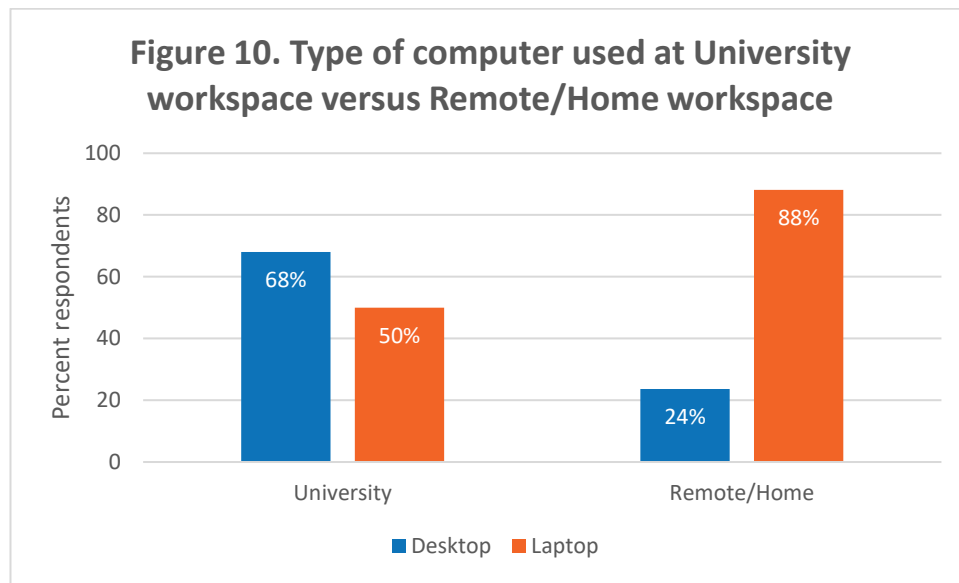
4.2. Computer Use

The use of laptops and desktops were investigated separately in this study, as the issues that arise from their use and the risks of developing MSS can be different. From an ergonomics viewpoint, the prolonged use of a laptop is not recommended because the attached screen and keyboard of a laptop promotes poorer working postures than when working at a desktop workstation. Working at a desktop workstation promotes more neutral postures that are tolerated much better by the user.

4.2.1. Type of computer

The study sought information on the type of computer used while working at home or in the university workspace (Figure 10).

- 88% used a laptop at home and 50% used one when working in the university ($p < 0.05$)
- 24% used a desktop at home and 68% used one when working in the university ($p < 0.05$)



Total respondents are >100% as some respondents used both desktop and laptop

4.2.2. Pattern of computer use

Information about the average number of hours per day spent working on a laptop or a desktop, and the length of time spent working at a computer *at any one time* was sought. The respondents reported working on a laptop more often and for longer hours at home than onsite at the university (Figures 11a and 11b). Over 70% of respondents reported that they usually worked on their laptops at home for ≥ 6 hours per day compared to 41% working for that duration when they were in their university workspace. Similarly, a greater proportion of respondents used a computer for longer *at any one time* when they were working at home compared to working in their university workspace (Figure 12). A greater proportion of respondents reported taking breaks from computer use when working at home (76.4%) compared to when working in the university (68.6%) (Figure 13).

Figure 11a. Hours per day on laptop

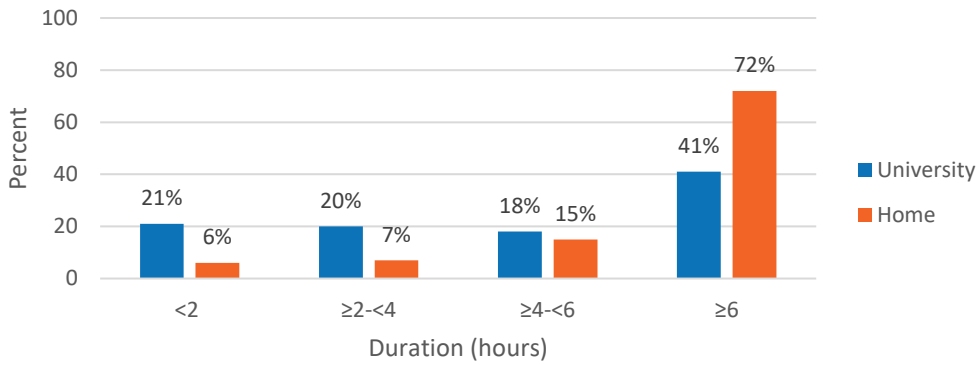


Figure 11b. Hours per day on desktop

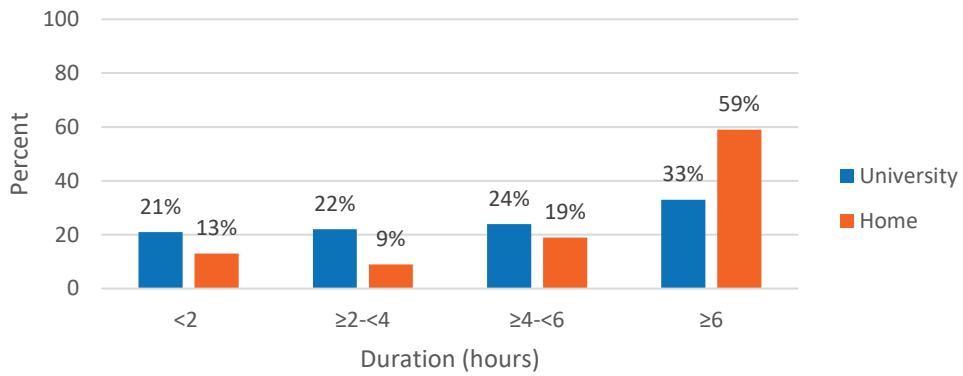


Figure 12. Computer use at any one time

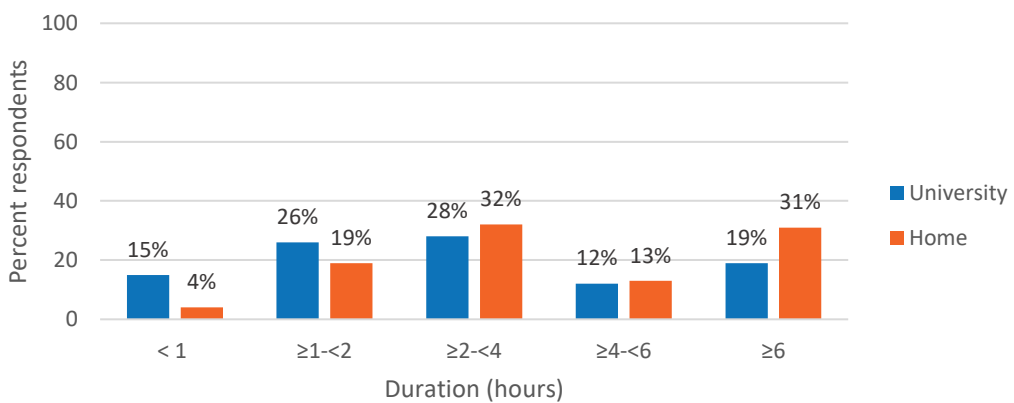
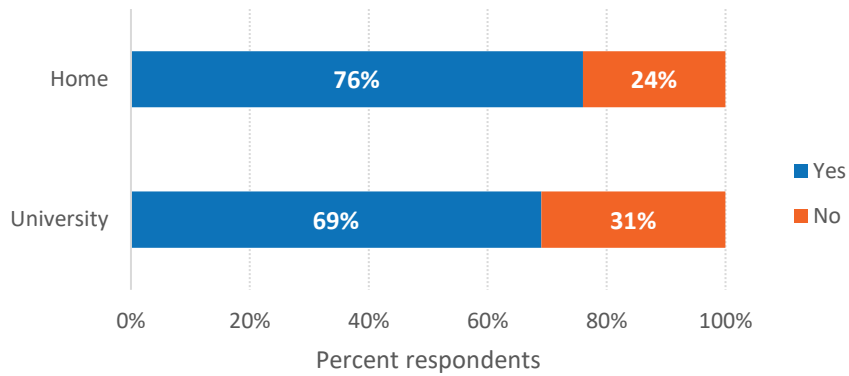


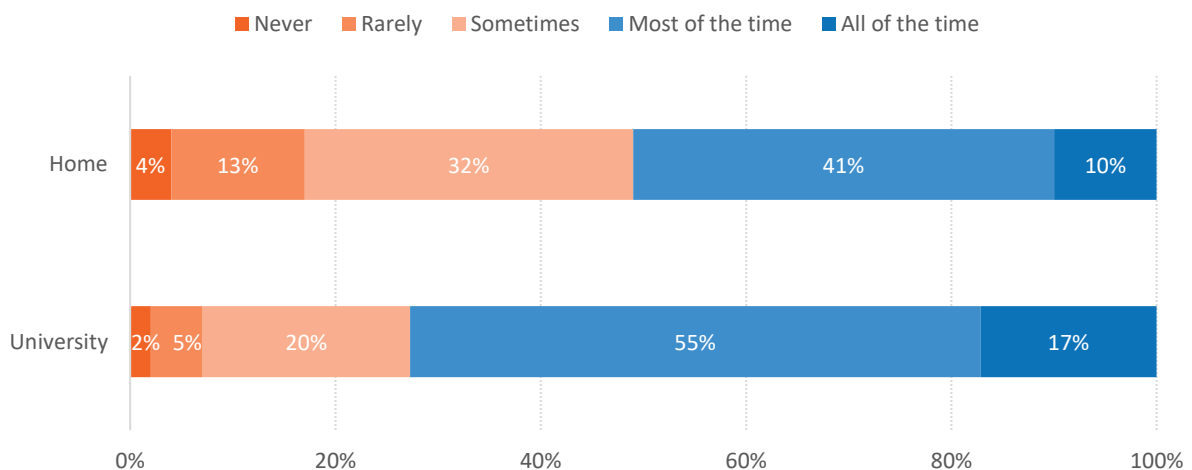
Figure 13. Take breaks



4.2.3. Comfort of the workspace

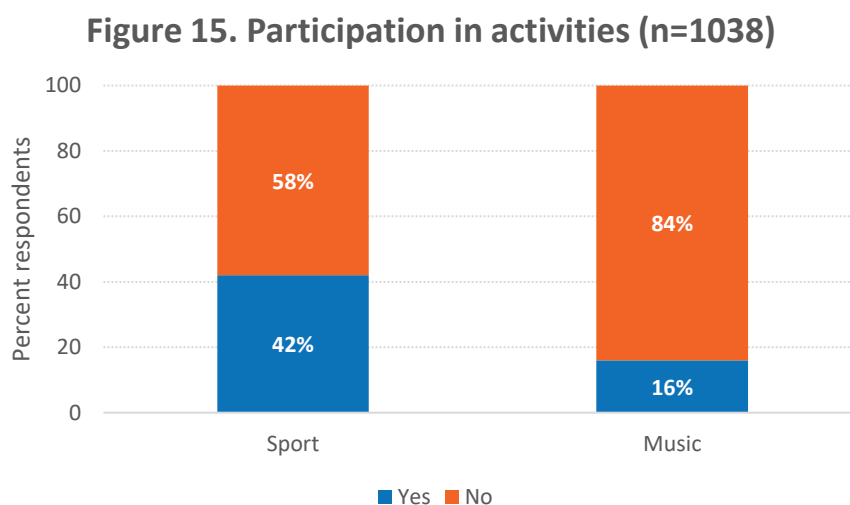
The respondents were asked to state if they found their workspace comfortable all the time, most of the time, sometimes, rarely, or never. A larger proportion of respondents reported that the university workspace was more comfortable compared to the workspace at home (Figure 14). Significantly more respondents (72%) reported that they were comfortable 'all or most of the time' in their university workspace, compared to 51.2% at home ($p < 0.05$).

Figure 14. Comfort of workspace



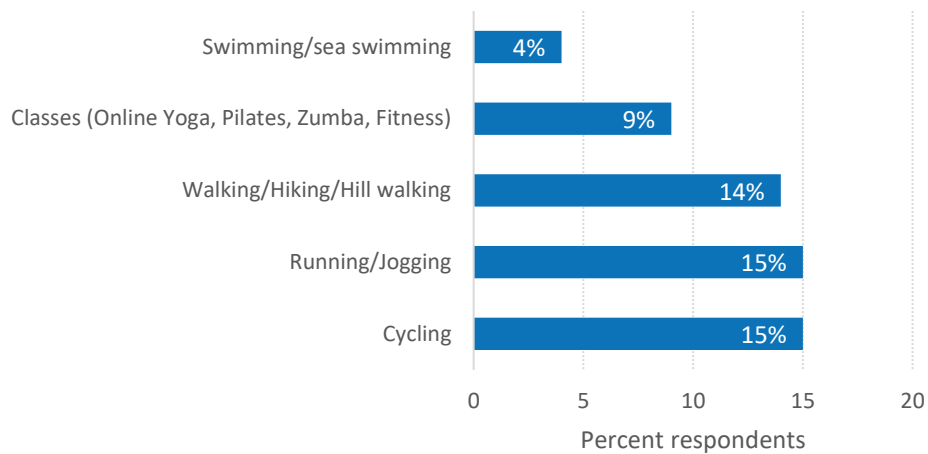
4.3. Other activities

Other activities were investigated as part of the survey, as some sports or leisure activities e.g., playing the piano or racquet sports would be considered risk factors for the development of an upper limb musculoskeletal disorder. They would involve using similar muscles to those when typing, and as such could be confounders for computer-related MSS. A greater proportion of respondents reported playing sport (41.9%) than music (16%) as shown in Figure 15. Of those who played, the majority of respondents played sport (92.3%) and/or music (97.6%) for leisure.



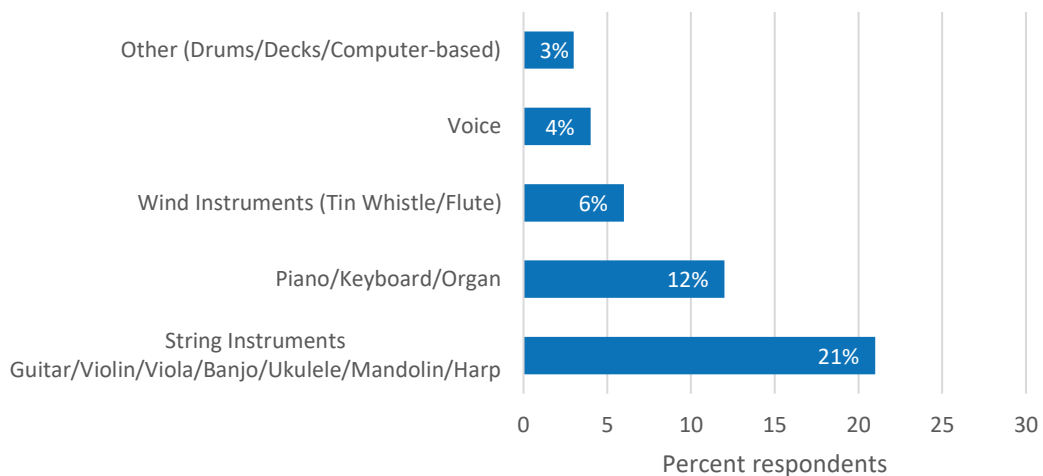
Regarding those who participated in sport, the five most frequently reported types of sport played are presented in Figure 16. The mean number of hours per week playing sport was 4.8 ± 3.3 with a range of 1 to 30 hours.

Figure 16. Types of sport (n=401)



With regard to music, the five most frequently reported types of musical instrument are presented in Figure 17. The mean number of hours per week playing music was 2.9 ± 2.77 with a range of 1 to 15 hours.

Figure 17. Types of musical instruments (n=161)



4.3.1. Technology for leisure

The respondents were asked to state how many hours per week they used technology for leisure purposes during the past 3 months. This question was included in order to consider the additional computer/technology usage outside of working hours that could influence computer-related MSS i.e.,

a confounder. Of the 980 responses to this question, 930 respondents reported using technology for leisure purposes. The mean number of hours per week using technology for leisure purposes was 12.85 ± 10.03 with a range of 1-60 hours.

4.4. Computer-related MSS

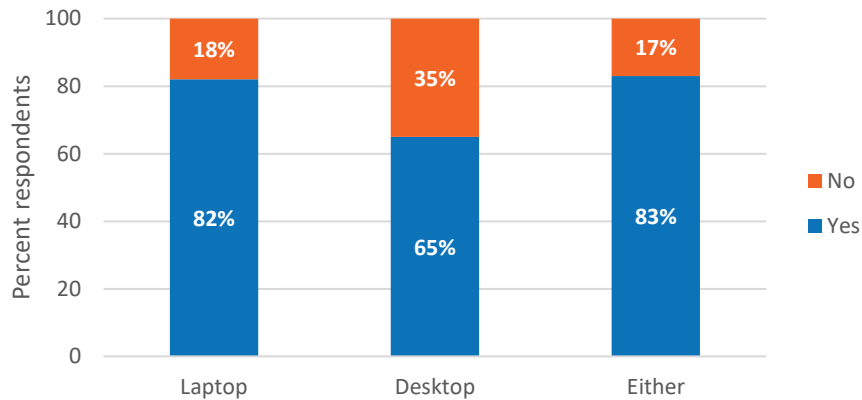
4.4.1. Prevalence of computer-related MSS

In this section of the questionnaire, participants were asked about MSS that they considered were 'caused by' or 'aggravated by' using a laptop or using a desktop computer. The respondents reported laptop-related MSS and desktop-related MSS separately. MSS related to using either a laptop or a desktop was computed by the researchers. A computer-related musculoskeletal symptom (MSS) was defined as ***'any ache, pain, discomfort, pins and needles or numbness (collectively termed 'symptoms') associated with your use of a laptop or desktop computer'***.

The 3-month prevalence of computer-related musculoskeletal symptoms was high, as shown in Figure 18. The analysis was based on n=1017 who answered this section.

- 83% reported they had computer-related MSS during the past 3 months i.e., MSS related to using either a laptop or a desktop
- 82.2% reported MSS related to using a laptop
- 64.6% reported MSS related to using a desktop
- Computer-related MSS was reported by 83.3% of respondents who worked at home only
- Computer-related MSS was reported by 84.6% of respondents who worked from home and onsite in the university
- Computer-related MSS was reported by 55.6% of respondents who worked onsite in the university only

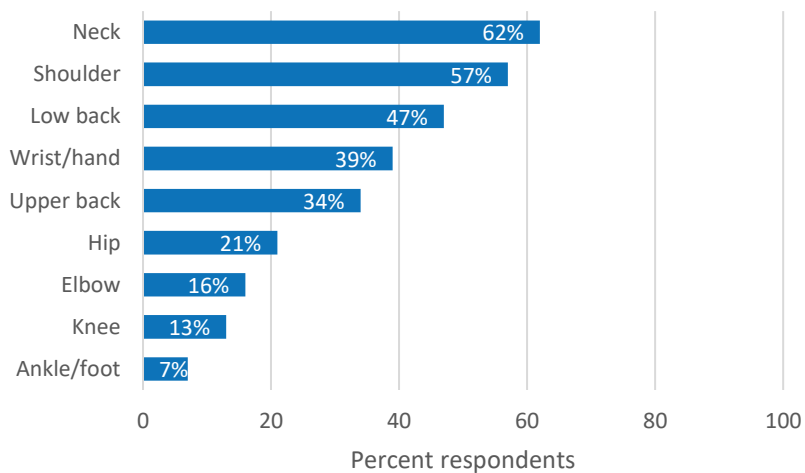
Figure 18. Computer-related MSS in past 3 months (n=1017)



4.4.2. Computer-related MSS by body part

The respondents were requested to identify all body parts that were symptomatic due to using a laptop or a desktop in the past 3 months. The body parts are those used in the Nordic Musculoskeletal Questionnaire (Kourinka et al. 1987). The analysis is based on 973 responses, as seventy-two (n=72) respondents did not complete this question. The prevalence by body part is presented in Figure 19. The neck (62.4%), shoulder (57%) and lower back (47.3%) were the most frequently reported symptomatic body parts.

Figure 19. Prevalence of MSS by body part (n=973)

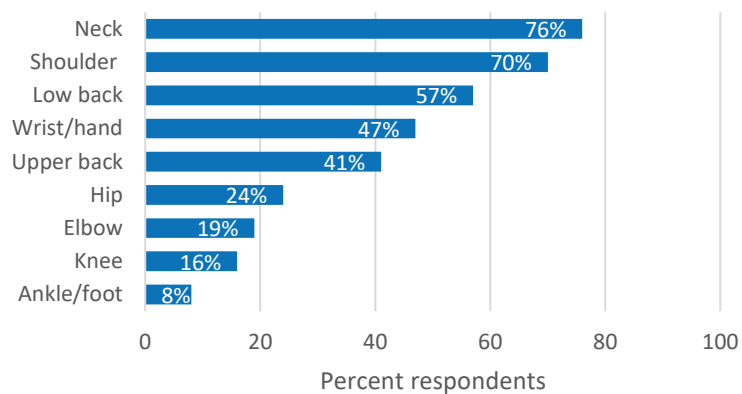


Total respondents are >100% as some respondents reported MSS in more than one body part

4.4.3. Laptop-related MSS

The respondents were asked to identify any symptoms by body part that were caused or aggravated by laptop use during the past 3 months. Figure 20 presents the reported 3-month prevalence by body part (n=698).

Figure 20. Laptop-related MSS reported by body part (n=698)

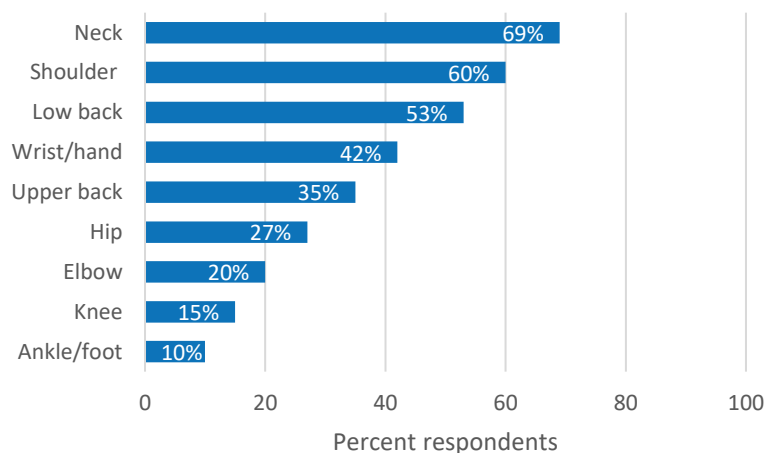


Total respondents are >100% as some respondents reported MSS in more than one body part

4.4.4. Desktop-related MSS

The respondents were asked to identify any symptoms by body part that were caused or aggravated by desktop use during the past 3 months. Figure 21 presents the reported 3-month prevalence by body part (n=271).

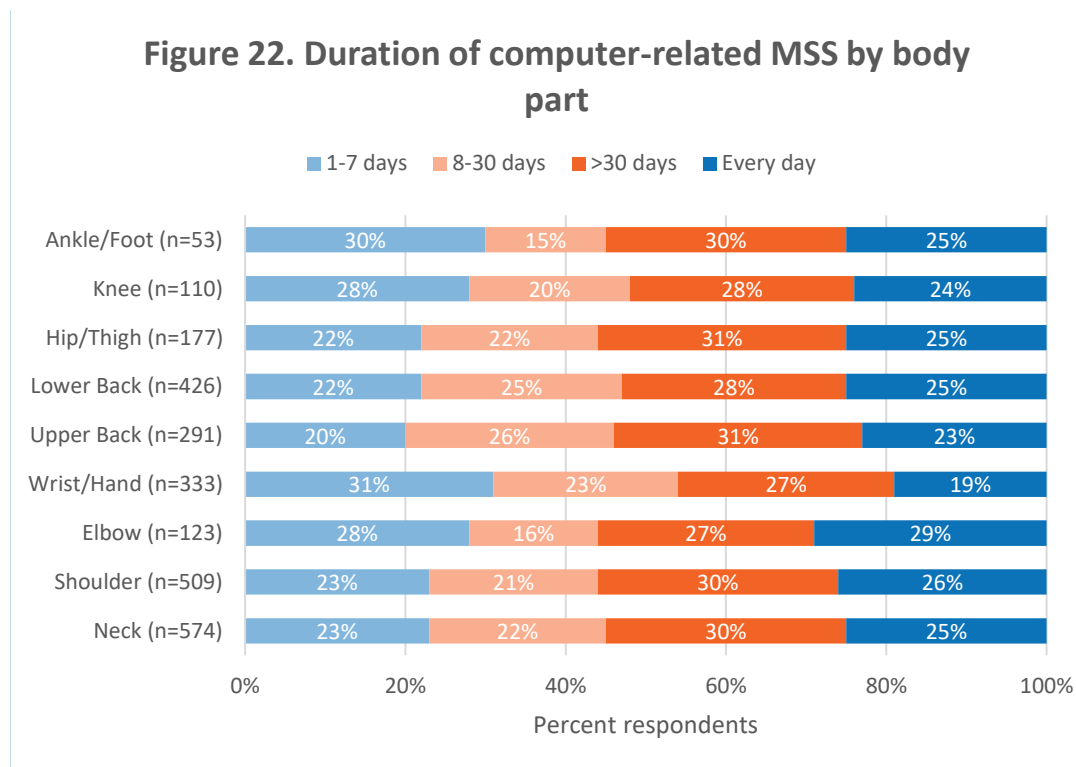
Figure 21. Desktop-related MSS by body part (n=271)



Total respondents are >100% as some respondents reported MSS in more than one body part

4.4.5. Duration of symptoms

The respondents were asked about the total length of time they had MSS in nine different body parts from laptop or desktop use in the past 3 months. The reported duration of symptoms and the numbers upon which the analysis is based is shown in Figure 22.



4.4.6. Factors associated with computer-related MSS

Chi-square analysis was used to test associations between computer-related MSS and hand dominance, gender, type of computer and equipment used at home and in the onsite university workspace.

- There was an association between MSS and gender ($p < 0.05$). The prevalence of computer-related MSS was greater in females (85%) compared to males (78.3%)
- There was an association between MSS and handedness ($p < 0.05$). The prevalence of computer-related MSS was greater in those who were righthanded (84.1%) compared to those who were lefthanded (72.7%)
- The prevalence of laptop-related MSS was significantly higher than desktop-related MSS for the neck ($p < 0.05$), shoulder ($p < 0.05$), and lower back ($p < 0.05$), but not for other body parts

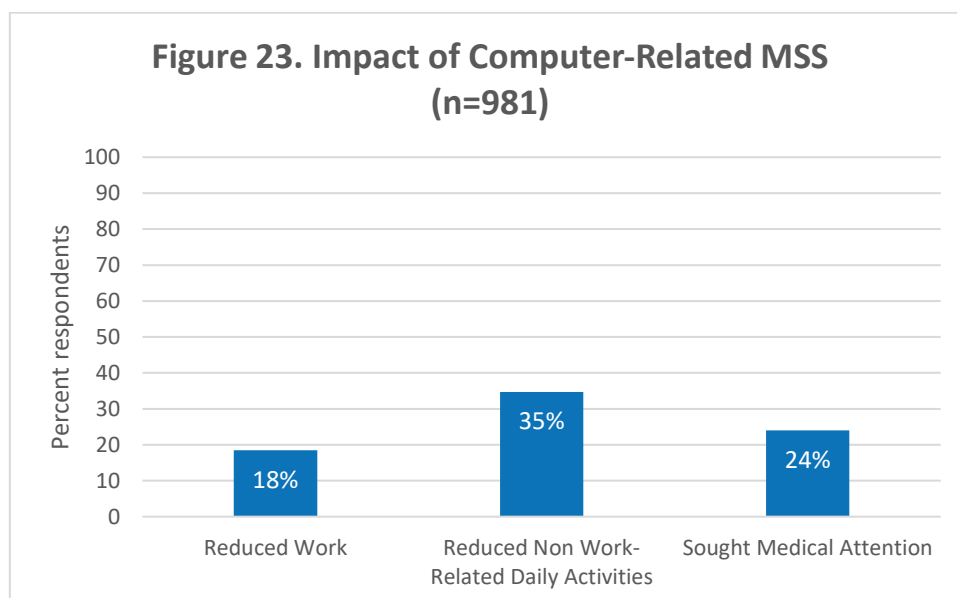
- There was a significant association between equipment use at home and MSS, with a lower prevalence of MSS (laptop or desktop) associated with the use of an office chair ($p < 0.05$), desk ($p < 0.05$) and monitor ($p < 0.05$), but not with a keyboard or a mouse (Table 1).
- There were no significant associations between equipment and MSS onsite at the university.
- There was a significant association between comfort and reported computer-related MSS in those who worked at home ($p < 0.05$). A significantly greater proportion of those who reported being comfortable 'sometimes' (93.9%) or 'rarely/never' (94.1%) reported MSS compared to those who reported being comfortable 'all/most of the time' (74%).
- There was no significant association in reported MSS between those who took breaks while using a computer and those who did not. However, a greater proportion of those who did not take breaks while working at a desktop (72.7%) reported MSS compared to those who took breaks (62.5%).
- There was a significant association ($p < 0.05$) in reported MSS between those who worked at home only (83.3%) and those who worked onsite in the university only (55.6%). (However, it must be noted that the numbers involved in each group were markedly different $n = 665$ working at home only and $n = 27$ working onsite in the university only).
- There was no association in reported MSS between those who worked at home only (83.3%) and those who worked at home and in their university workspace (84.6%).
- Significantly more respondents who worked at home only reported desktop-related MSS (80.8%) compared to those who combined working from home and onsite in the university (54%) $p < 0.05$.
- There was no significant association in reported laptop-related MSS between those who worked at home only (70.5%) and those who combined working from home and onsite in the university (78.8%).

Table 1. Association between use of equipment at home and computer-related MSS

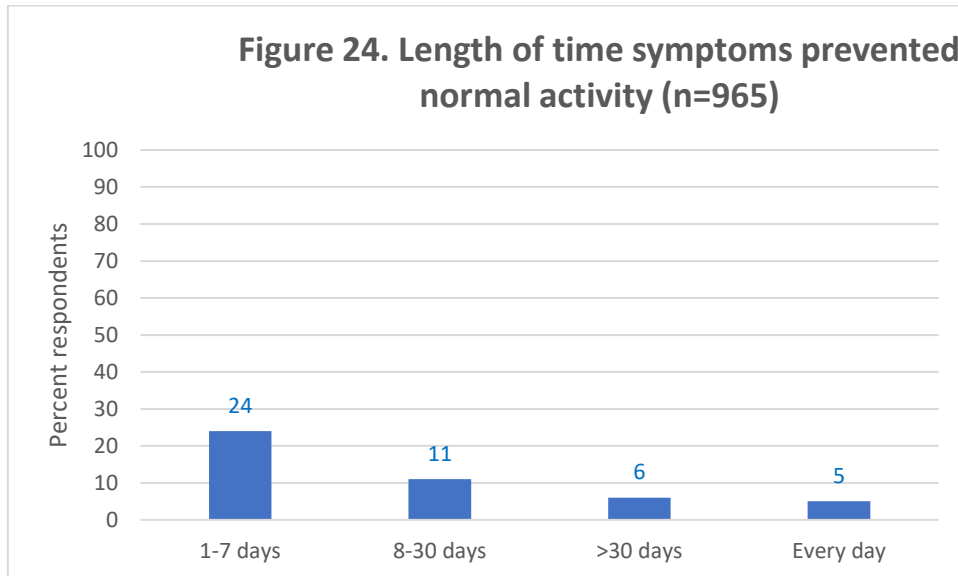
| Equipment at home | Computer-related MSS | | X ² | p | |
|-------------------|----------------------|-------------|----------------|---------|-------|
| | Yes % (n) | No % (n) | | | |
| Chair | Yes | 80.7 (419) | 19.3 (100) | 7.2346 | <0.05 |
| | No | 87 (410) | 13 (61) | | |
| Desk | Yes | 77.5 (327) | 22.5 (95) | 21.0931 | <0.05 |
| | No | 88.4 (502) | 11.6 (66) | | |
| Monitor | Yes | 80.2 (380) | 19.8 (94) | 8.5045 | <0.05 |
| | No | 87 (449) | 13 (67) | | |
| Keyboard | Yes | 83.2 (511) | 16.8 (103) | 0.312 | 0.576 |
| | No | 84.6 (318) | 15.4 (58) | | |
| Mouse | Yes | 83.3 (590) | 16.7 (118) | 0.298 | 0.585 |
| | No | 84.8 (239) | 15.2 (43) | | |

4.5. Impact of computer-related MSS

The impact of computer-related symptoms on the respondents' daily lives was assessed by asking them if their symptoms caused a reduction in their work activity or their leisure activity, or if their symptoms caused them to see a doctor, physiotherapist, chiropractor, or other practitioner. Computer-related symptoms resulted in a reduction in non-work-related activities (35%), work activities (18%) and seeking medical attention (24%) as shown in Figure 23.



The respondents were asked about the total length of time that their symptoms prevented them from doing normal activities during the past 3 months. Almost a quarter of respondents (24.5%) were prevented from doing normal activities for between 1 and 7 days and 4.6% of respondents were prevented from doing normal activities every day (Figure 24).



5. Conclusions and Recommendations

This study was undertaken during a unique and unusual period amidst a global pandemic. The focus of the study was the computer-related work practices of the university community, the physical characteristics of the onsite and remote computer workstations, and the prevalence and impact of computer-related MSS among the staff during this period. This report found that, as expected during this time, the majority of respondents worked from home only.

The findings in this report are important for two reasons. Firstly, is that in keeping with public health advice, the university staff were instructed to work from home at short notice in March 2020, with no clear insight into how long the situation was likely to last. This was a unique situation in which to capture information about remote workplaces. Secondly, university staff frequently work from home under 'normal' conditions and are likely to continue to do so in the future. If staff are working from home on a regular basis, they may be working in similar workspaces as described in this report. Therefore, the findings may be relevant to future remote working by university employees.

This report highlights the following as key priorities that need to be addressed in order to minimise the risk of computer-related MSS for both those working in the university workspace and those engaged in hybrid working, which incorporates a home workspace.

5.1. Addressing the prevalence of MSS among staff

A large proportion of the respondents reported computer-related MSS and the impact for some individuals was a resulting reduction in their non-work-related and work-related activities, with some respondents needing to seek medical attention because of their MSS. Laptop computers were more commonly used in the home workspace and significantly more respondents reported MSS associated with laptop computer use compared to desktop computer use.

Possible interventions include:

- Provision of an education resource regarding strategies to minimise the risk of MSS when using a laptop computer.
- Provision of an education resource regarding strategies to minimise the risk of MSS when using a desktop computer.
- Ensure that workstation design is audited and suitable in both the university and home workspace.

- There is considerable evidence and guidance available, therefore it is recommended that an awareness campaign be undertaken. This initial campaign should be supported by appropriate information resources to promote safer working at computers in the future.

5.2. Improving workstation comfort

A significantly greater proportion of those who reported being comfortable only 'sometimes' or 'rarely/never' reported MSS compared to those who reported being comfortable 'all/most of the time'. Being comfortable while doing computer-related work is an important factor.

While the majority of those who worked onsite in the university worked in a dedicated office workspace, results indicated that just less than half of staff working at home did not have a dedicated workspace and instead reported working at the kitchen table, dining table or the bedroom. Approximately a quarter of staff reported not taking regular breaks when working at their home workplace and almost a third of staff reported not taking regular breaks when working at their university workplace.

There were no significant associations between equipment and MSS onsite at the university. However, significantly more respondents had access to an office chair, desk, keyboard, and mouse in the university workspace compared to the home workspace. There was a significantly lower prevalence of MSS (laptop or desktop) associated with the use of an office chair, desk and monitor in the home workspace.

Possible interventions include:

- Provision of appropriate computer equipment (including office chair, desk, monitor, keyboard, and mouse) for the university workspace.
- Provision of appropriate computer equipment (including office chair, desk, monitor, keyboard, and mouse) for the home workspace.
- Education of staff regarding the importance of maintaining a comfortable computer workstation and the importance of taking regular breaks.

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APPENDIX 1. Survey in Word

The Pattern of Computer Use and the Prevalence of Musculoskeletal Symptoms During Covid-19

The questionnaire has questions across 4 sections: computer use; other activities; demographics; musculoskeletal symptoms. It should take **about 5-10 minutes** to complete.

Your participation in this survey is completely voluntary and all your responses will be kept confidential.

This is an **anonymous survey** and means no personal identifiable information will be associated with your data. Your IP address will not be recorded and therefore cannot be traced. This also means you cannot withdraw your response if you complete and submit the survey. If you decide not to participate you will not be penalised. Please note that by completing and returning the survey you are providing your informed consent to participate in this study. The School of Medicine Research Ethics Committee has approved this study (Application Number: 20210105).

Please see the Participant Information Leaflet in the link below.

SECTION 1: COMPUTER USE

As a result of COVID-19 restrictions, many staff members have been carrying out their work duties by working at home as well as at their TCD workspace.

This section enquires about the pattern of your computer use **both at your TCD workspace and your home workspace.**

Think about **your work-related computer use in the past 3 months**.

1.1 What proportion (%) of time do you spend?

Working at TCD workspace: _____

Working at home workspace: _____

Skip To: 1.11 If 1.1 What proportion (%) of time do you spend working at home workspace =100

1.2 Do you use a **laptop** in your **TCD workspace**?

Yes

No

Skip To: 1.4 If 1.2 Do you use a laptop in your TCD workspace? = No

1.3 How many hours **on average per day** do you spend using a **laptop** in your **TCD** workspace?

- < 1 hour
- ≥ 1 hour - < 2 hours
- ≥ 2 hours - < 4 hours
- ≥ 4 hours - < 6 hours
- ≥ 6 hours

1.4 Do you use a **desktop computer** in your **TCD** workspace?

- Yes
- No

Skip To: 1.6 If 1.4 Do you use a desktop computer in your TCD workspace? = No

1.5 How many hours **on average per day** do you use a **desktop computer** in your **TCD** workspace?

- < 1 hour
- ≥ 1 hour - < 2 hours
- ≥ 2 hours - < 4 hours
- ≥ 4 hours - < 6 hours
- ≥ 6 hours

1.6 How long do you **usually** spend on a **laptop OR desktop computer** at your **TCD workspace** at any one time?

- < 0.5 hours
- ≥ 0.5 hours - < 1 hour
- ≥ 1 hour - < 2 hours
- ≥ 2 hours - < 4 hours
- ≥ 4 hours - < 6 hours
- ≥ 6 hours

1.7 Do you **usually** take breaks during this time? i.e., stop using the **laptop/desktop computer** or leave the workstation at your **TCD workspace**?

- Yes
- No

1.8 Where do you usually work on your **laptop/desktop computer** at your **TCD workspace**?

- Dedicated office
- 'Hot desk' space
- Lab desk or bench
- Other (please specify) _____

1.9 Please specify if you have (the use of) any of the following when you are working at your **TCD workspace**. (Please tick **all that apply**).

- Dedicated office chair
- Dedicated office-type desk
- Monitor, compatible with your laptop
- Keyboard
- Mouse
- Other _____

1.10 Do you find your **TCD workspace** is a comfortable place to work?

- All of the time
- Most of the time
- Sometimes
- Rarely
- Never

1.11 Do you use a **laptop** when working at your **home workspace**?

- Yes
- No

Skip To: 1.13 If 1.11 Do you use a laptop when working at your home workspace? = No

1.12 How many hours **on average per day** would you spend using a **laptop** when working at your home workspace?

- < 1 hour
- ≥ 1 hour - < 2 hours
- ≥ 2 hours - < 4 hours
- ≥ 4 hours - < 6 hours
- ≥ 6 hours

1.13 Do you use a **desktop computer** when working at your home workspace?

- Yes
- No

Skip To: 1.15 If 1.13 Do you use a desktop computer when working at your home workspace? = No

1.14 How many hours **on average per day** would you spend using a **desktop computer** when working at your home workspace?

- < 1 hour
- ≥ 1 hour - < 2 hours
- ≥ 2 hours - < 4 hours
- ≥ 4 hours - < 6 hours
- ≥ 6 hours

1.15 How long do you **usually** spend on a **laptop OR desktop computer** when working at your home workspace at any one time?

- < 0.5 hours
- ≥ 0.5 hours - < 1 hour
- ≥ 1 hour - < 2 hours
- ≥ 2 hours - < 4 hours
- ≥ 4 hours - < 6 hours
- ≥ 6 hours

1.16 Do you **usually** take breaks during this time? i.e., stop using the computer/laptop or leave the workstation when working at your home workspace?

- Yes
- No

1.17 Where do you usually work when working at your home workspace?

- Dedicated home office
- Dedicated working space
- Kitchen table
- Dining table
- Other (please specify) _____

1.18 Please specify if you have (the use of) any of the following when you are working at your home workspace. (Please tick **all that apply**).

- Dedicated office chair
- Dedicated office-type desk
- Monitor, compatible with your laptop
- Keyboard
- Mouse
- Other

1.19 Do you find your home workspace is a comfortable place to work?

- All of the time
- Most of the time
- Sometimes
- Rarely
- Never

SECTION 2: OTHER ACTIVITIES

This section enquires about **other activities** that you may be involved in.

2.1 Did you participate in sport during the **past 3 months**?

Yes

No

Skip To: 2.5 If 2.1 Did you participate in sport during the past 3 months? = No

2.2 What is your main sport (please specify)?

2.3 Do you play sport...

| | Yes | No |
|----------------|-----------------------|-----------------------|
| for leisure? | <input type="radio"/> | <input type="radio"/> |
| competitively? | <input type="radio"/> | <input type="radio"/> |

2.4 For how many **hours per week** have you played/trained in a sport during the **past 3 months**?

2.5 Did you play a musical instrument during the **past 3 months**?

Yes

No

Skip To: Q2.9 If 2.5 Did you play a musical instrument during the past 3 months? = No

2.6 What is the main musical instrument you play? (please specify)

2.7 Do you play the musical instrument...

| | Yes | No |
|-------------------------------|-----------------------|-----------------------|
| for leisure? | <input type="radio"/> | <input type="radio"/> |
| competitively/professionally? | <input type="radio"/> | <input type="radio"/> |

2.8 For how many hours per week have you played the musical instrument during the past 3 months?

2.9 For how many **hours per week** have you used technology **for leisure purposes** during the **past 3 months** (examples include laptop, desktop, tablet, phone as a tablet, gaming console)?

SECTION 3: DEMOGRAPHICS

This section will ask for some general information about you.

3.1 What is your gender?

- Male
- Female
- Non-binary
- Prefer not to say

3.2 What is your age?

- 20 to 29 yrs.
- 30 to 39 yrs.
- 40 to 49 yrs.
- 50 to 59 yrs.
- 60+ years

3.3 Are you...

- Left-handed?
- Right-handed?

3.4 What Faculty/Administrative Area are you in?

- Arts, Humanities and Social Sciences
- Engineering, Mathematics and Science
- Health Sciences
- CSD
- ASD
- FSD
- Other (please specify) _____

3.5 Please tick which of the following best describes you as a staff member.

- Academic staff
- Administrative staff
- Clinical Lecturer/Co-ordinator
- Demonstrator
- Research Assistant
- Research Fellow/Post Doc
- Technical Officer
- Other (please specify) _____

SECTION 4: MUSCULOSKELETAL SYMPTOMS

In this section you will be asked about **any symptoms** you may have had that are **associated with laptop OR computer use** during the **past 3 months**.

4.1 During the past 3 months have you had any **ache, pain, discomfort, pins and needles or numbness** (collectively termed 'symptoms') associated with your use of...

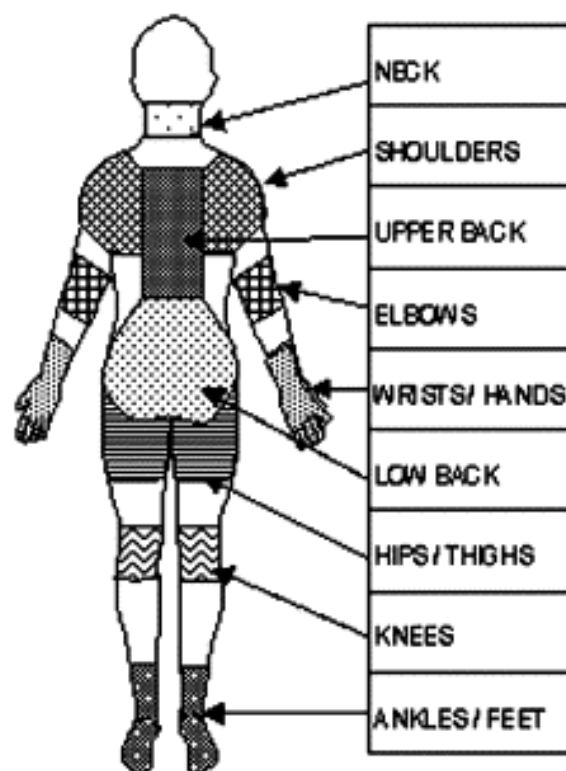
| | Yes | No |
|-------------------|-----------------------|-----------------------|
| laptop? | <input type="radio"/> | <input type="radio"/> |
| desktop computer? | <input type="radio"/> | <input type="radio"/> |

Skip To: End of Survey If 4.1 During the past 3 months have you had any ache, pain, discomfort, pins and needles or numbness... = No

Almost there...

The next few questions ask you to tell us a little more about symptoms you may have had that are associated with laptop OR computer use during the **past 3 months**.

Nordic Musculoskeletal Questionnaire Body Diagram



4.2 During the past 3 months when using a laptop were the symptoms...

Please tick **all that apply**.

| | caused by laptop use? | aggravated by laptop use? |
|------------|------------------------------|----------------------------------|
| Neck | <input type="checkbox"/> | <input type="checkbox"/> |
| Shoulder | <input type="checkbox"/> | <input type="checkbox"/> |
| Elbow | <input type="checkbox"/> | <input type="checkbox"/> |
| Wrist/Hand | <input type="checkbox"/> | <input type="checkbox"/> |
| Upper Back | <input type="checkbox"/> | <input type="checkbox"/> |
| Lower Back | <input type="checkbox"/> | <input type="checkbox"/> |
| Hip/Thigh | <input type="checkbox"/> | <input type="checkbox"/> |
| Knee | <input type="checkbox"/> | <input type="checkbox"/> |
| Ankle/foot | <input type="checkbox"/> | <input type="checkbox"/> |

4.3 During the **past 3 months** when using a desktop computer were the symptoms...

Please tick **all that apply**.

| | caused by desktop computer use? | aggravated by desktop computer use? |
|------------|--|--|
| Neck | <input type="radio"/> | <input type="radio"/> |
| Shoulder | <input type="radio"/> | <input type="radio"/> |
| Elbow | <input type="radio"/> | <input type="radio"/> |
| Wrist/Hand | <input type="radio"/> | <input type="radio"/> |
| Upper Back | <input type="radio"/> | <input type="radio"/> |
| Lower Back | <input type="radio"/> | <input type="radio"/> |
| Hip/Thigh | <input type="radio"/> | <input type="radio"/> |
| Knee | <input type="radio"/> | <input type="radio"/> |
| Ankle/Foot | <input type="radio"/> | <input type="radio"/> |

4.4 What is the total length of time that you had symptoms (from laptop OR desktop) during the past 3 months?

Please tick **all that apply**.

| | 0 days | 1-7 days | 8-30 days | More than 30 days but not every day | Every day |
|------------|-----------------------|-----------------------|-----------------------|-------------------------------------|-----------------------|
| Neck | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Shoulder | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Elbow | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Wrist/Hand | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Upper Back | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lower Back | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Hip/Thigh | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Knee | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Ankle/Foot | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

4.5 During the **past 3 months**, have your symptoms (**from laptop OR desktop**) caused you to...
Please tick **all that apply**.

| | reduce your work activity? | reduce your leisure activity? | see a doctor, physiotherapist, chiropractor or other? |
|------------|----------------------------|-------------------------------|---|
| Neck | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Shoulder | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Elbow | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wrist/Hand | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Upper Back | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lower Back | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Hip/Thigh | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Knee | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Ankle/Foot | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

4.6 What is the **total length of time** that the symptoms (**from laptop OR desktop**) have **prevented you from doing normal activities** during the **past 3 months**?
Please tick **all that apply**.

| | 0 days | 1-7 days | 8-30 days | More than 30 days but not every day | Every day |
|------------|-----------------------|-----------------------|-----------------------|-------------------------------------|-----------------------|
| Neck | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Shoulder | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Elbow | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Wrist/Hand | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Upper Back | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lower Back | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Hip/Thigh | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Knee | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Ankle/Foot | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |