Self-reported ache, pain, or numbness in hip and lower back and use of computers and cell phones amongst Finns aged 18–65

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A running head: Hip and lower back symptoms

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Abstract

The aim of our work is to study persons who self-reported aches, pain, or numbness in the hip and lower back very often and their use of computers and cell phones via a questionnaire. The study was carried out as a cross-sectional study by posting a questionnaire to 15,000 working-age persons, and among all respondents (6121), 8.2% of them reported that they very often experienced pain, numbness, and aches in the hip /lower back. Thirty-eight percent of them used a desktop computer at work daily, and 79.0% used cell phones at leisure. As a group, they had more physical and mental symptoms than others. We found also significant differences in the use of different computers at work. In the future, it is important to take into account that persons' physical symptoms in the hip and lower back very often can be associated with other physical or mental symptoms and computer usage.

Relevance to industry:

Hip and lower back symptoms are quite common discomforts that affect the productivity and well-being of industrial workers. A large-scale questionnaire offers a good reference for evaluating the prevalence of the hip and lower back symptoms associated with other symptoms and usage of computers and cell phones.

Keywords: back pain, hip pain, physical symptoms, questionnaire, computer

1. Introduction

In recent years, the use of different computers and cell phones has greatly increased both at work and at leisure all around the world and now, especially in some countries, involves the large majority of the population. In Finland, according to the Finnish Statistics Office (2015), in 2012, 88% of Finnish households have a computer and 72% own a laptop. In the same country, almost all young – middle aged persons use the Internet: 90% of people aged 18–64 years according to the report of the Finnish Statistics Office (2015), and the use of Internet is increasingly involving also aged people (66-74 years): 61%. In the Fourth European Working Condition Survey Report, around 26% of employees worked with a computer either all or almost all of the time (Parent-Thirion et al., 2007).

These relevant changes are likely to have an influence also symptoms prevalence in computers and cell phone users, especially considering that the physical demands for computer work are different than those required during typical manufacturing and industrial tasks even though computer tasks quite often require lower levels of physical force than industrial work. According to Jonsson (1988) and Hoyle et al. (2011), an important aspect of computer work is that the muscles are rarely (if ever) able to relax completely; therefore, the duration of sustained contraction is thought to be a critical component for musculoskeletal disorder risk.

In effect, pain symptoms are the most common health problems among the working population (Mehlum et al. 2006). Hsu and Wang (2003) and Ming et al. (2004) have reported musculoskeletal disorder prevalence rates of 20% to over 75% among computer workers or similar workers. Specifically considering low back pain (LBP), 12 months prevalence ranging e.g. from 26% to 75% were reported in different working population (Porter and Gyi 2002; Trinkoff et al., 2002; Ijzelenberg,

2005; Alexopoulos et al.2006); but in office workers prevalences up to 51% and higher have been recently reported (Akrouf et al., 2010).

Cho et al. (2012) investigated the prevalence of musculoskeletal symptoms for office workers with a high computer workload in Taiwan. They sent two questionnaires to three companies and one university; they received answers from 254 subjects, 203 of which met the inclusion criteria. They found that high psychological distress was significantly associated with upper back and shoulder pain. Additionally, the high workload was associated with LBP.

The influence of psychosocial factors on persons with acute LBP has been studied. For example, Fritz and George (2002) have examined baseline psychosocial variables and their ability to predict prolonged work restrictions. They suggested that fear avoidance beliefs are the most important psychosocial variable for patients with acute, work-related LBP (Fritz and George, 2002).

A reduction of LBP in computer users can be obtained by adequate ergonomic interventions. E.g., Pillastrini et al. (2012) assessed the effectiveness of a workstation ergonomic intervention for work-related posture and LBP in Video Display Terminal (VDT) workers (100 VDT workers and control group). Their results contribute to the evidence that individualized ergonomic interventions may be able to improve work-related posture and reduce LBP for VDT workers.

As the use of technical equipment, e.g, personal computers, portable computers, notebooks, cell phones, and more recently, also tablets, e-readers, and smartphones, has increased, it is important to recognize the possible health effects that can be linked to new technologies. Therefore, we conducted a study in 2002 on possible influences of new technical equipment on the health of the working-age population via a questionnaire divided into six sections and sent to about 15,000 Finns. The first

section dealt with background information, such as age, gender, marital status, education, occupation, and home county. In Section Two, the familiarity and use of given technical devices at leisure and at work were mapped. The third section focused on physical loading and ergonomics, and the fourth section was concerned with psychological welfare. Accidents and close-call situations at leisure or at work were handled in the fifth section, and the last part was an open-ended question: “other observations concerning technology and health”. The details of the questionnaire and the results of the ergonomic health aspects and mental symptoms in all data have been reported earlier (Korpinen et al., 2009; Korpinen and Pääkkönen, 2009). Furthermore, we reported in our earlier article that persons who very often had symptoms in the neck also had other symptoms very often (e.g., exhaustion at work). Moreover, their use of information and communication technology (e.g., computers) is associated with their symptoms (Korpinen et al., 2013).

1.1. Aim of the study

The aim of this study was to determine the possible relation between self-reported hip and lower back symptoms (aches, pain, or numbness) and computers/cell phone usage, and to analyze how the symptoms are specifically associated with the use of desktop computers, portable computers or mini-computers, and cell phones. As the use of computer and laptop, but also mini-computers, and cell phones frequently enhance sedentary behavior, and prolonged sit long times, and it can have an influence on the hip and lower back of users. Is it possible to find associations between the use of these technical equipment, and users' hip and lower back symptoms? We evaluated the frequency of self-reported symptoms and the frequency of the use of PCs, laptops, minicomputers, and cell phones. The hypothesis is that these new devices may increase the risk of developing hip and LBP related to, e.g., poor postures or to other factors. We have also considered the relation between self-reported mental symptoms, other physical symptoms, and background information.

2. Methods

2.1. Study population and questionnaire

In October 2002, a questionnaire was sent to 15,000 Finns. As the study focused on the working age population, only people aged 18–65 were included. Names and addresses were obtained as a random sample from the Finnish Population Register Centre. The study design was approved by the local Ethical Committee (Pirkanmaa Health District, Finland, decision R02099).

2.2. Statistical analysis

The questionnaire included three questions regarding symptoms in the hip and lower back. In the first the responders have to refer the presence of symptoms in the last 12 months, (“13) *Have you had any ache, pain, or numbness in the following body part during the last twelve months?*”) the anatomic localization (“a) *in wrists and fingers, b) in elbows and forearms, c) in neck, d) in shoulders, e) in hip and lower back, f) in feet*”) and the frequency (“cannot say,” “not at all,” “sometimes,” “quite often,” “often,” and “very often”). In the second items the responders have to subjectively refer the possible association of symptoms to the use of computer (“14) *Have you had an ache, pain or numbness, which you associate with desktop computer use, in the following body parts during the last 12 months? a) in wrists and fingers, b) in elbows and forearms, c) in neck, d) in shoulders, e) in hip and lower back, f) in feet*”; again, the possible answers were: “cannot say,” “not at all,” “sometimes,” “quite often,” “often,” and “very often,” and in the third to portable computers, including laptops, minicomputers, and cell phones (“15) *Have you had an ache, pain or numbness, which you associate with portable computer use, in the following body parts during the last 12 months? a) in wrists and fingers, b) in elbows and forearms, c) in neck, d) in shoulders, e) in hip*

and lower back, f) in feet”). The first item (Question 13) was more general, where Questions 14 and 15 are leading questions in this study. We only report the amount of the answers to these questions.

Only persons who had aches, pain, or numbness in the hip and lower back were chosen. Subjects were classified in groups according to the frequency of symptoms: Group 1 persons who reported aches, pain, or numbness in the hip and lower back very often, Group 2 persons who reported the same symptoms often, Group 3: persons who reported symptoms quite often, and Group 4: persons referring aches, pain, or numbness in the hip and lower back sometimes. The options to Question 13) “Have you had any ache, pain, or numbness in the following body part during the last twelve months? a) in wrists and fingers, b) in elbows and forearms, c) in neck, d) in shoulders, e) in hip and lower back, f) in feet” were “cannot say,” “not at all,” “sometimes,” “quite often,” “often,” and “very often”. We coded the answers such that “cannot say,” “not at all,” and “sometimes” corresponded to 0 (no symptoms), 1 (quite often), 2 (often), and 3 (very often), respectively. Likewise, the answers to question “16) Have you suffered from a) sleeping disorders/disturbances, b) depression, c) exhaustion at work, d) substance addiction, e) anxiety, or f) fear situations during the last 12 months?” were codified in the same manner. The options to Question “11) How often do you use the following equipment or services at work? a) mobile phone, b) desktop computer, c) Internet, d) electronic commerce, e) portable computer or mini-computer, f) teletext and g) digital television etc.,” were “cannot say,” “not at all,” “less than monthly,” “monthly,” “weekly,” and “daily”. In the analyses, we used persons who answered daily. The statistical analyses were performed using IBM SPSS Statistics versions 19 and 20.

In the first analysis of questions 13a–d,f and 16a–f, we used an independent samples Mann-Whitney U-Test. In the analyses of persons with symptoms in the hip and lower back (Group 1–4), we compared the groups: 1) respondents who used a desktop computer daily at work and non-users, 2)

respondents who used a portable computer or a mini-computer at work daily and non-users, 3) female respondents who used a desktop computer at work daily and non-users, and 4) male respondents who used a desktop computer at work daily and non-users.

In the second analysis, using an independent samples Mann-Whitney U-Test, we compared the questions 13a–d,f and 16a–f between persons with symptoms in the hip and lower back quite often or more (Group A: persons, who answered “quite often,” “often,” and “very often”) and others (Group B) with subgroups: 1) all respondents in work life, 2) respondents who used a desktop computer daily at work, 3) female respondents who used a desktop computer at work daily, 4) male respondents who used a desktop computer at work daily, and 5) respondents who used a portable computer or a mini-computer at work daily.

In the third analysis, the first age groups were classified (under 20, 21–30, 31–40, 41–50, 51–60, and over 60). The statistical analyses consisted of General Linear Models (GLMs) with the symptoms assigned as target variables. We classified question “11) How often do you use the following equipment or services at work? b) desktop computer and e) portable computer or mini-computer, so that answers “cannot say,” “not at all,” “less than monthly,” “monthly,” and “weekly” were coded as 0 (no daily use) and the answer “daily” was 1 (daily use). The occupations were classified as the following; “none” was 1, “enterprisers” were 2, “farmers” were 3, “upper-level white-collar workers” were 4, “lower-level white-collar workers” were 5, “blue-collar workers” were 6, “home work, student” was 7, and “other” was 8. In the analyses for Question 13a–d,f, the model factors were as follows: age, gender, daily usage of a desktop computer at work (Q11b), daily usage of a portable computer or mini-computer at work (Q11e), occupation, and two-way interactions age x gender. We performed this analysis on Groups 1, 2, and 3; however, we did not compare these groups because their mean ages were not the similar and the number of answers in the

groups was quite limited. We reported earlier different analyses of mental symptoms (Korpinen and Pääkkönen, 2009). Therefore we did not use Question 16 in the third analysis. In this study, a p-value of 0.05 was chosen.

3. Results

3.1. Background information

In total, 6121 questionnaires were collected; the resulting response rate was 41%. The mean age $\pm$ standard deviation (SD) was 41.3 ± 13.1 years. In Group 1 (symptoms very often), the number of responses was 500 (8.2%), the mean age $\pm$ SD was 44.7 ± 12.9 years, and 66.9% of them were employed. In Group 2 (symptoms often), the number was 645 (10.5%), the mean age $\pm$ SD was 41.2 ± 13.1 years, and 72.6% of them had employment. In Group 3 (symptoms quite often), the number was 874 (14.3%) of them, the mean age $\pm$ SD was 40.9 ± 13.5 years, and 73.1% of them were in the work force. In Group 4 (symptoms sometimes), the number was 2196 (35.9%), the mean age $\pm$ SD was 40.2 ± 12.9 years, and 74.6% of them were in working life.

Table 1 presents background information and the results of all persons, women, and men with symptoms in the hip and lower back very often. Group 1 included 325 (65.1%) women, 174 (34.9%) men, and one missing; Group 2 included 400 (62.0%) women and 245 (38.0%) men; Group 3 included 512 (58.6%) women, 361 (41.4%) men, and one missing; and in Group 4, there were 1264 (57.6%) women, 929 (42.4%) men, and three missing. Table 1 shows that 38.0% of respondents with symptoms in the hip and lower back very often used daily desktop computers at work. In Group 2, the number was 44.2% (285); in Group 3, the number was 44.1% (385), and in Group 4, the number was 45.8% (1006). In Questions “8) How often do you use the following equipment or services for leisure? a) mobile phone, b) desktop computer, c) internet, d) electronic commerce, e) portable computer or

mini-computer, f) teletext and g) digital television etc.” (options: “cannot say,” “not at all,” “less than monthly,” “monthly,” “weekly,” and “daily”) 11 (Table 1), and in usage of different technical devices, the number of “daily” answers can be found. Table 1 demonstrates the other symptoms of the respondents with symptoms in the hip and lower back very often and illustrates the number of answers “very often”, which means that the table shows only those numbers that correspond to the answers “very often” for the questions.

To Question (14), “Have you had an ache, pain or numbness, which you associate with desktop computer use, in the following body parts during the last 12 months? (e) in hip and lower back,” Group 1 answered very often 18.0%, often 7.8%, quite often 3.8%, and sometimes 9.0%, and all respondents answered very often 1.8%, often 2.9%, quite often 4.5%, and sometimes 16.1%

To Question 15 (symptoms associated with portable computer use): Group 1 answered very often 5.5%, often 1.8%, quite often 0.8%, and sometimes 2.0%, and all respondents answered very often 0.6%, often 0.5%, quite often 0.8%, and sometimes 3.3% .

3.2. Results of the Mann-Whitney U-Test

Table 2 shows the analyses of physical symptoms in wrists and fingers, elbows and forearms, neck, shoulders, and feet (Question 13a, b, c, d, and f, respectively). In the analyses of Groups (2–4), there were some significant differences in the comparison between daily desktop computer users and non-users in terms of the aches, pain, or numbness in the feet or shoulder symptoms. In Group 2 (symptoms often), there was a significant difference in the comparison between daily portable computer users and non-users in terms of the aches, pain, or numbness in the neck symptoms. Table 3 provides the analyses of questions on mental symptoms: sleeping disorders, depression,

exhaustion at work, substance addiction, anxiety, and fear situations (16a, b, c, d, e, and f), respectively). In the men's data (Group 1), there was a difference in the answers regarding anxiety and fear situations between daily desktop computer users and non-users.

Table 4 gives analyses between persons with symptoms in the hip and lower back quite often or more and others. In all of the workers' and daily desktop computer users' data, there were differences between all in Questions 13a–d,f and 16a,b,c,e. Similarly, there were significant differences between the women's and men's data. There were also some significant differences in Question 16f.

3.3. GLM results

Tables 5 delineates the results of the statistical analyses of answers to Question 13a–d,f with the following factors: age, gender, daily usage of a desktop computer at work (Q11b), daily usage of a portable computer or mini-computer at work (Q11e), and occupation. Age had an influence on Question 13a,b,d,f in some of the groups. Gender had an influence on Question 13c,d,f in some of the groups. Occupation had an influence on Questions 13c (symptoms in neck) and 13f (symptoms in feet) in Group 2 (symptoms in hip and lower back often). Some relation can also be seen together with two-way interactions.

4. Discussion

4.1. Evaluation of methods

The study population was 15,000 working-age Finns, and we received a large number of responses (6121). Therefore, we can make analyses on the subgroups of person with physical symptoms. In these analyses, 500 responses were used from persons who reported aches, pain, or numbness in the hip and lower back very often during the last twelve months. The questionnaire included only three questions regarding symptoms in the hip and lower back. Therefore, we were not able to obtain very much information about the respondents' hip and lower back symptoms.

The approach applied in this study has some limitations. For example, the questionnaire and the questions posed could have influenced the participants, and most likely, only those who are proactive sent back the questionnaire. In addition, personal opinions can change quite quickly as technology develops. All participants perhaps did not understand the symptoms in the same manner, and the questionnaire did not include all possible questions or symptoms. We did not ask anything regarding physical load at work, which is an important factor in analyses of back pain. There can also be other factors that influence symptoms at work, for example, the atmosphere.

On the other hand we are confident that the adopted approach is valid to study of a possible relation between the use of computers (especially laptops, other portable computers, and cell phones) and back pain and hip symptoms in large groups of population.

Data were collected in 2002–2003, but there is no reason to suppose that any possible relation between computer use and symptoms is changed and, on the other hand, our findings can be possibly considered more important and significant nowadays. In addition, several workers use similar computers nowadays to what they used when we collected the data. Therefore, our data is still valid. Moreover, the use of computers has increased, and many tasks have changed such that workers use

more computers. For example, the use of paper has decreased in offices, and workers sit more than in previous years. It is important to evaluate the data and find possible associations.

4.2. Evaluation of results of persons with symptoms in hip and lower back very often

Table 1 shows that in the data of persons with symptoms in the hip and lower back (very often), there was a higher prevalence among blue-collar workers, and lower- and upper-level white collar workers, with blue-collar workers being the highest (41.7%). They may have more physical load in their occupations than white collar workers; however, this is speculative, as we did not collect data on physical load. Earlier studies have reported that physical load at work can affect the occurrence of LBP (Bernard et al., 1997; Burdorf and Sorock, 1997; Hoogendoorn et al., 1999; Hoogendoorn et al., 2000). Persons with symptoms in the hip and lower back (very often) were older and more likely retired than other persons. It is possible that their symptoms are the reason why they are not employed. Seventy-nine percent of them used a cell phone at leisure daily, and 38% of them used a desktop computer at work daily. Furthermore, only 18.0% of them thought that their symptoms were associated with desktop computer use, and 42.6% answered not at all. It is possible that some of the respondents with symptoms very often in the hip and lower back had problems with the ergonomics of the computer; therefore, they had symptoms in the hip and lower back. However, it was only a minute group of them.

The persons with symptoms in the hip and lower back very often also had many other physical and mental symptoms (Table 1). For example, 57.4% of them had symptoms in the neck, 44.8% had symptoms in the feet, and 37.8% had symptoms in the shoulders, which are comparatively higher than in all data (15.1%, 7.0%, and 8.0%, respectively). Conversely, it is quite easy to understand that persons can have symptoms in different areas of the body and lower limbs. They also reported more sleeping disorders/disturbances, depression, exhaustion at work, anxiety, and fear situations than all respondents. For example, 12.0% of them had sleeping disorders/disturbances very often; 9.8% of

them had exhaustion at work; and 6.4% had depression very often. All respondents' values were 3.3%, 2.7%, 1.7%, respectively. The persons with symptoms in the hip and lower back (very often) also often had other physical or mental symptoms.

Women reported symptoms in the hip and lower back more often than men (Table 1). Women had more physical symptoms than men, particularly in the neck, shoulders, and feet. Typically, women reported more symptoms than men. For example, Hogg-Johnson et al. (2008) have also reported that neck pain was more prevalent among women. Men with symptoms in the hip and lower back very often reported fewer additional symptoms, e.g., substance addiction and anxiety.

We found significant differences when we compared persons with symptoms quite often or more often in the hip and lower back to the persons who did not report as many symptoms (Table 4). There were many significant differences when we compared persons who used computers daily at work. Computer use can affect persons with symptoms in the hip and lower back as well as other physical and mental symptoms. However, there is no difference in substance addiction.

Table 5 reveals that we found significant differences, e.g., in age, gender, and occupation. In Group 1 (symptoms in the hip and lower back very often), persons with symptoms were older than others. In Group 2 (symptoms often), occupation has a significant impact on the symptoms in the neck and feet. It is possible that persons with symptoms in the hip and lower back very often (Group 1) have other causes for their symptoms as persons with similar symptoms often (Group 2).

Based on our results, it is possible that the use of computers influences persons' symptoms in the hip and lower back, but there are also other possible explanations, such as age and mental symptoms. We did not inquire about physical load at work, which could also be an explanation. Eklöf et al. 2004 and Pransky et al. 2002 have found that stress is also a common problem in work

life that is related to psychosocial factors and that it may be associated with musculoskeletal complaints. Their findings support our results. It is also an important finding that persons with symptoms very often in the hip and back had many other physical and mental symptoms very often; for example, 12% of them had sleeping disorders/disturbances. An aspect that cannot be ignored is that the use of new technologies, such as portable computers and cell phones, may interfere with psychosocial factors, e.g., increasing workload.

Our hypothesis was that these new devices may increase the risk of developing hip and lower back pain related to, e.g., poor postures or to other factors, and we analyzed the relation among self-reported mental symptoms, other physical symptoms, and background information. We found some significant differences in groups of persons with self-reported aches, pain, or numbness in the hip and lower back very often, often, quite often, and sometimes, e.g., in symptoms in the neck, in the shoulders, and in the feet. However, we did not uncover significant differences in all groups. We also found significant differences in other symptoms and background information between persons with symptoms in the hip and lower back quite often or more and others using different subgroups. In general, we could accept our hypothesis.

Conclusion

In conclusion, the results of this questionnaire study, based on more than 6,000 answers from the working age population, show that 8.2% of Finnish workers experience pain, numbness, and aches in the hip and lower back very often. They also had other symptoms very often, e.g., 57.4% had symptoms in the neck, 44.8% in the feet, and 37.8% had symptoms in the shoulders. In addition, 12.0% of them very often had sleeping disorders/disturbances, and 9.8% of them reported exhaustion at work very often. Thirty-eight percent of them used a desktop computer at work daily. When comparing persons with symptoms in the hip and lower back quite often or more often to others, we found that they had more additional physical and mental symptoms. There were also significant

differences in use of different computers at work. In the future, it is essential to take into account that the persons with symptoms in the hip and lower back very often can have other symptoms very often (e.g., sleeping disorders/disturbances). Additionally, the usage of different computers can influence their symptoms.

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Tables

Table 1. A summary of background information and the results of persons (women and men) with hip or lower back symptoms very often, the daily usage of different devices/computers at work and at

leisure, mental symptoms, and experienced pain, numbness, or aches (number of positive answers including answers “very often”).

Table 2. Comparison between computer users and non-users with an independent samples Mann-Whitney U-Test analysis for Question 13a-d,f, using data of the persons with symptoms in the hip and lower back very often, often, quite often, and sometimes.

Table 3. Comparison between computer users and non-users with an independent samples Mann-Whitney U-Test analysis for Question 16 using data of the persons with symptoms in the hip and lower back very often, often, quite often, and sometimes.

Table 4. Comparison between persons with symptoms in the hip and lower back quite often or more to others with an independent samples Mann-Whitney U-Test analysis for Questions 13a-d,f and 16, using data of the persons with symptoms in the hip and lower back quite often or more often and without.

Table 5. The results (Type III Sum of Squares and significance (Sig.) of statistical analyses for Question 13a-d,f, using data of the persons with symptoms in the hip and lower back very often, often, and quite often.

Table 1.

Topics of questions and choices	Women % (n= 325)	Men, % (n=174)	Total% (n=500)
Marital status			
single (n=85)	17.0	17.2	17.0
married or live-in (n=354)	67.9	76.4	70.9
divorced (n=47)	11.7	5.2	9.4
widow or widower (n=13)	3.4	1.1	2.6
Education			
comprehensive school(n=136)	26.2	29.3	27.3
matriculation(n=39)	9.3	5.2	7.8
vocational school (n=159)	27.2	40.2	31.9
vocational high school (n=127)	29.0	19.0	25.5
university (n=38)	8.3	6.3	7.6
Occupation			
none (n=2)	0.3	0.6	0.4
enterpriser (n=45)	6.5	14.0	9.1
farmer (n=28)	6.2	4.7	5.6
upper-level white-collar workers *(n=56)	12.7	8.7	11.3
lower-level white-collar workers **(n=108)	24.5	16.9	21.8
blue-collar workers *** (n=207)	38.4	47.7	41.7
home work, student (n=21)	5.6	1.7	4.2
other (n=29)	5.9	5.8	5.8
Use at leisure (daily)			
mobile phone (n=395)	78.8	79.3	79.0
desktop computer (n=123)	22.5	28.7	24.6
internet (n=88)	15.7	21.3	17.6
portable computer or mini-computer (n=14)	1.8	4.6	2.8
Use at work (daily)			
mobile phone (n=179)	29.8	47.1	35.8
desktop computer (n=190)	41.5	31.6	38.0
internet (n=117)	24.3	21.8	23.4
portable computer or mini-computer (n=29)	5.5	6.3	5.8
Experienced pain, numbness or aches			
in wrists or fingers (n=122)	28.0	17.8	24.4
in elbows or forearms (n=82)	19.7	10.3	16.4
in neck (n=287)	66.8	39.7	57.4
in shoulders (n=189)	41.2	31.0	37.8
in feet (n=224)	49.5	36.2	44.8
Mental symptoms			
sleeping disorders/ disturbances (n=60)	13.5	9.2	12.0
depression (n=32)	6.2	6.9	6.4
exhaustion at work (n=49)	11.4	6.9	9.8
substance addiction (n=3)	0.3	1.1	0.6
anxiety(n=27)	4.9	6.3	5.4
fear situations (n=14)	2.2	4.0	2.8

* Administrative or managerial duties, designing, research, teaching, ** clerical duties and supervision, *** industrial workers, distributive and service trade

Table 2

Participants	Q13: Have you had an ache, pain or numbness in the following body part during the past 12 months?				
	Wrists and fingers	Elbows and forearms	Neck	Shoulders	Feet
Persons with symptoms in hip/lower back very often (n=500)					
Users – no users	0.867	0.742	0.106	0.538	0.591
Laptop users – no users	0.662	0.899	0.613	0.375	0.152
Female users – no users	0.382	0.280	0.621	0.497	0.768
Male users – no users	0.821	0.111	0.200	0.107	0.600
Persons with symptoms in hip/lower back often (n=645)					
Users – no users	0.195	0.717	0.701	0.070	<0.001**
Laptop users – no users	0.575	0.878	0.009**	0.042**	0.149
Female users – no users	0.412	0.861	0.619	0.645	<0.001**
Male users – no users	0.270	0.756	0.721	0.008**	0.027**
Persons with symptoms in hip/lower back quite often (n=874)					
Users – no users	0.747	0.929	0.116	0.620	0.042**
Laptop users –no users	0.445	0.648	0.111	0.479	0.460
Female users – no users	0.768	0.906	0.161	0.500	0.163
Male users – no users	0.835	0.913	0.910	0.575	0.077
Persons with symptoms in hip/lower back sometimes (n=2196)					
Users – no users	0.496	0.928	<0.001**	0.789	0.005**
Laptop users –no users	0.836	0.911	0.208	0.176	0.069
Female users – no users	0.384	0.500	0.002**	0.966	0.036**
Male users – no users	0.758	0.410	0.271	0.366	0.047**

**=significant at $p < 0.05$

users = workers, who use a desktop computer daily at work, laptop users = workers, who use daily a portable computer or a mini-computer at work,

Table 3

Participants	Q16: Have you suffered from one of the following symptoms in the past 12 months?					
	Sleeping disorders/ disturbances	Depression	Exhaustion at work	Substance addiction	Anxiety	Fear situations
Persons with symptoms in hip/lower back very often (Group 1)						
Users ¹ – nonusers	0.667	0.450	0.931	0.831	0.091	0.677
Laptop users ² – nonusers	0.435	0.878	0.860	0.376	0.979	0.605
Female users – nonusers	0.894	0.779	0.582	0.283	0.683	0.311
Male users – nonusers	0.593	0.170	0.579	0.981	0.026**	0.049**
Persons with symptoms in hip/lower back often (Group 2)						
Users ¹ – nonusers	0.294	0.287	0.172	0.545	0.868	0.517
Laptop users ² – nonusers	0.638	0.985	0.314	0.399	0.875	0.690
Female users – nonusers	0.449	0.558	0.100	1.000	0.231	0.182
Male users – nonusers	0.493	0.303	0.903	0.699	0.215	0.613
Persons with symptoms in hip/lower back quite often (Group 3)						
Users ¹ – nonusers	0.974	0.699	0.983	0.421	0.696	0.390
Laptop users ² – nonusers	0.303	0.787	0.081	0.317	0.153	0.044**
Female users – nonusers	0.826	0.314	0.828	0.557	0.293	0.174
Male users – nonusers	0.635	0.589	0.894	0.659	0.550	0.797
Persons with symptoms in hip/lower back sometimes (Group 4)						
Users ¹ – nonusers	0.016**	0.191	0.016**	0.361	0.192	0.294
Laptop users ² – nonusers	0.788	0.829	0.233	0.497	0.667	0.835
Female users – nonusers	0.419	0.744	0.010**	0.212	0.734	0.499
Male users – nonusers	0.007**	0.120	0.474	0.957	0.105	0.477

Notes.**p < .05, asymptotic significance; 1—workers who use a desktop computer daily at work, 2—workers who use daily a portable computer or a mini-computer at work.

Table 4

Participants	Q13: Have you had an ache, pain or numbness in the following body part during the past 12 months?					
	Wrists and fingers	Elbows and forearms	Neck	Shoulders	Feet	
All workers	<0.001**	<0.001**	<0.001**	<0.001**	<0.001**	
Daily desktop computer users ¹	<0.001**	<0.001**	<0.001**	<0.001**	0.001**	
Female desktop computer users	<0.001**	<0.001**	<0.001**	<0.001**	<0.001**	
Male desktop computer users	<0.001**	<0.001**	<0.001**	<0.001**	<0.001**	
Daily portable computer or mini-computer users ²	<0.001**	<0.001**	<0.001**	<0.001**	<0.001**	
Participants	Q16: Have you suffered from one of the following symptoms in the past 12 months?					
	Sleeping disorders/ disturbances	Depression	Exhaustion at work	Substance addiction	Anxiety	Fear situations
All workers	<0.001**	<0.001**	<0.001**	0.263	<0.001**	<0.001**
Daily desktop computer users ¹	<0.001**	<0.001**	<0.001**	0.377	<0.001**	0.004**
Female desktop computer users	<0.001**	<0.001**	<0.001**	0.807	<0.001**	0.247
Male desktop computer users	<0.001**	<0.001**	<0.001**	0.112	<0.001**	0.001**
Daily portable computer or mini-computer users ²	0.002**	0.011**	<0.001**	0.489	0.002**	0.025**

Notes. **p < .05, asymptotic significance; 1—workers who use a desktop computer daily at work, 2—workers who use daily a portable computer or a mini-computer at work.

Table 5.

Q13: Have you had an ache, pain or numbness in the following body part during the past 12 months?					
Source of variation	Wrists and fingers	Elbows and forearms	Neck	Shoulders	Feet
	Sig.	Sig.	Sig.	Sig.	Sig.
Persons with symptoms in hip/lower back very often (group 1)					
Age	0.016**	0.001**	n.s.	n.s.	n.s.
Gender	n.s.	n.s.	0.002**	n.s.	n.s.
Use of a desktop computer ¹	n.s.	n.s.	n.s.	n.s.	n.s.
Use of a portable computer ²	n.s.	n.s.	n.s.	n.s.	n.s.
Occupation	n.s.	n.s.	n.s.	n.s.	n.s.
<i>Two-way interaction</i>					
Age x gender	n.s.	n.s.	n.s.	n.s.	n.s.
Persons with symptoms in hip/lower back often (group 2)					
Age	0.001**	<0.001**	n.s.	0.002**	n.s.
Gender	n.s.	n.s.	<0.001**	0.005**	n.s.
Use of a desktop computer ¹	n.s.	n.s.	n.s.	n.s.	n.s.
Use of a portable computer ²	n.s.	n.s.	n.s.	n.s.	n.s.
Occupation	n.s.	n.s.	0.010**	n.s.	0.014**
<i>Two-way interaction</i>					
Age x gender	n.s.	n.s.	0.033**	n.s.	n.s.
Persons with symptoms in hip/lower back quite often (group 3)					
Age	n.s.	n.s.	n.s.	n.s.	0.003**
Gender	n.s.	n.s.	<0.001**	n.s.	0.006**
Use of a desktop computer ¹	n.s.	n.s.	n.s.	n.s.	n.s.
Use of a portable computer ²	n.s.	n.s.	n.s.	n.s.	n.s.
Occupation	n.s.	n.s.	n.s.	n.s.	n.s.
<i>Two-way interaction</i>					
Age x gender	0.010**	n.s.	n.s.	n.s.	0.043**

Notes: ** = significant at $p < 0.05$; 1 = daily use of a desktop computer at work, 2 = daily use of a portable computer or mini-computer at work, n.s.: not significant