COMPLAINTS OF ARM, NECK AND/OR SHOULDER PROBLEMS AMONG UNIVERSITY TEACHERS AND PUBLIC ADMINISTRATION EMPLOYEES IN SLOVENIA

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Abstract. *Working at a computer is often associated with sedentariness and complaints of the arm, neck and/or shoulder, which occur most frequently in office workers. Complaints of the arm, neck and/or shoulder are musculoskeletal disorders that are not result of an acute injury or systemic disease. The aim of this paper is to determine prevalence of complaints of arm, neck and/or shoulder among Slovenian employees who work predominantly at a computer. The Maastricht Upper Extremity Questionnaire was used to analyse typical complaints of the arm, neck and/or shoulder in the online tool 1KA. The participants were university teachers and public sector employees who work with computers. Examining the prevalence of complaints of the arm, neck and/or shoulder disorders among university teachers (N = 152) and civil servants (N = 83), the prevalence of complaints of the arm, neck and/or shoulder is lower in office workers than in university teachers. The highest prevalence among university teachers is in the neck (57%), shoulders (49%) and wrists (31%), while the prevalence among civil servants is 49% in the neck, 46% in shoulders and 31% in the wrists.The prevalence of the complaints of the arms, neck and/or shoulders upper in Slovenian studies is similar to results from foreign studies and is more common on the right side of the body. The evidence for an association between individual risk factors and the complaints of the arms, neck and/or shoulders is not strong enough. Muscosceletal disorders related to working too much at a computer are a public health problem. Despite the regulations on working with a display screen, Slovenian companies show many deviations in the design of the working environment. The results of our research demonstrate the need for measures to reduce computer-related complaints and maintain health. A longitudinal study would be needed to further investigate the risk factors and prevalence of complaints of the arm, neck and/or shoulder.*

Key words: *working with a computer, complaints of the arm, neck and/or shoulder, risk factors, ergonomics*

Introduction

Complaints of arm, neck and/or shoulder (hereafter CANS) are the most common musculoskeletal disorders in people who work mainly at a computer. Neck disorders are the most common, followed by hand, shoulder, wrist, elbow, upper arm and forearm disorders [1]. Experts have classified 23 conditions as specific CANS. Carpal tunnel syndrome, cubital tunnel syndrome, rotator cuff tendonitis, trigger finger and others are common problems in people who work predominantly at a

computer [2]. Non-specific disorders include 'stiff neck syndrome', which causes fatigue, neck pain, perceived knotting in the muscles, and/or headache [3].

Musculoskeletal disorders, particularly neck and shoulder disorders, were more common in women than in men, even though they worked in the same company and had the same job [4]. According to Haik et al [5], one of the most commonly reported conditions resulting from prolonged sitting in the office is acute and chronic shoulder pain associated with rotator cuff tears. Problems were more common on the right side of the body.

The Maastricht Upper Extremity Questionnaire (MEUQ) is most commonly used to assess the prevalence of CANS in office workers [6]. This investigates the influence of psychosocial and ergonomic aspects on working conditions, the prevalence of CANS and the strategies used by persons to alleviate problems. CANS has been studied extensively in office workers, but less so in academic settings. A cohort study on a university population conducted by Bruls et al [7] provided insights into the course of CANS and its severity. The results show mild to moderate CANS in terms of various domains of the International Classification of Functioning, reduced ability and poorer health.

In Slovenia, CANS was studied in employees who work mainly at a computer in the public sector, the economy and private companies. The highest prevalences of CANS were expressed in the neck, shoulders and wrists [8-10].

The aim of our study is to investigate the prevalence of CANS in University of Ljubljana teachers and public administration office workers. We investigated the risk factors for CANS.

Methods

Data Collection Methods and Techniques

The Maastricht Upper Extremity Questionnaire – MUEQ (Eltayeb et al., 2007) was used for quantitative data collection in the online tool 1KA. The online version of the questionnaire was distributed by e-mail to employees who use a computer more than half of the time at work. The questionnaire was distributed by the management of the five member faculties of the University of Ljubljana to the university teachers and by the management of the selected Ministry to its employees.

Instruments

The MUEQ assesses the prevalence and nature of complaints of the arm, neck and/or shoulder (CANS) in people working with computers and the associated physical and psychosocial risk factors. It consists of six sets of questions about the workplace, posture during work, quality of breaks, job demands, job control and social support. The questions in these sets are answered on a 5-point Likert scale as

follows: always, often, sometimes, rarely, never. This is followed by questions on the quality of the working environment and the frequency, type and symptoms of musculoskeletal complains of the arm, neck and/or shoulder, as well as demographic questions.

Description of the sample

A total of 235 participants were included in the quantitative data processing, including 152 university teachers from selected members of the University of Ljubljana, of whom 44 (28.9%) were male and 108 (71.1%) were female, aged between 25 and 70 years (average 48.6 years), and 83 public administration employees, of whom 9 (10.8%) were male and 74 (89.2%) were female, aged between 30 and 62 years (average 45.2 years).

Description of data analysis

Exploratory factor analysis was carried out to divide the items for each of the six main clusters into several factors. Principal component analysis (PCA) with Varimax rotation was used. Factor analysis helped to identify the different factors within the main strands of the questionnaire. These may represent risk factors for the development of CANS. The reliability of each scale was checked by calculating Cronbach alpha coefficients. The goodness of fit of the analysis was calculated using the Kaiser-Meyer-Olkin (KMO) measure. The following limits were considered for the acceptability/appropriateness of the sample KMO greater than 0.5: poor fit; KMO between 0.5 and 0.7: moderate fit; KMO between 0.7 and 0.9: good fit; KMO above 0.9: excellent fit. Variables with KMO below 0.5 were discarded [11]. The optimal value of the index obtained by the Kaiser-Meyer-Olkin test was 0.8. We considered that a value between 0.5 and 0.6 was still acceptable [18]. A chi-square test was used to compare the prevalence of CANS between university teachers and civil servants. A 95% confidence interval was considered. SPSS version 26.0 was used to process the data.

Results

The Maastricht Upper Extremity Questionnaire was completed in full by 152 university teachers and 83 civil servants. Table 1 shows the difference in the prevalence of CANS in the past year, lasting at least one week, between university teachers and civil servants. In the case of university teachers, they appear to have more CANS than civil servants in most locations, the most notable being anywhere on the upper limb as a whole with a prevalence of 0.72, followed by the neck with a prevalence of 0.57, then the shoulder with a prevalence of 0.49 and the wrist with a prevalence of 0.31. On average, university teachers spend 6.2 hours per day at the computer, while civil servants spend 7.4 hours per day. Using a chi-square test, we found that there was no statistically significant difference in prevalence between the different groups of workers.

Table 1. Difference in prevalence of CANS during the previous year that lasted at least one week between university teachers and civil servants.

Anatomical location	University teachers (N=152)	Civil servants (N=83)
Neck	0.57	0.49
Shoulder	0.49	0.46
Upper arm	0.15	0.17
Elbow	0.14	0.14
Lower arm	0.18	0.08
Wrist	0.31	0.31
Hand	0.17	0.17
Any upper extremity	0.72	0.60

The symptoms of CANS reported by the participating university teachers and civil servants at the end of the working day are shown in Table 2. The most common symptom was fatigue in the upper extremity at the end of the working day. This was followed by pain in the upper limb, stiffness in the fingers, weakness in the upper extremity, tingling in the fingers, constant pain and/or tingling in the upper extremity, numbness in the fingers, swelling in the hand and swelling/ stiffness in the upper extremity. Changes in colour, temperature and sweating in the upper extremity were reported by 3.3% of university teachers.

In order to alleviate pain in the upper extremities, a good third of university teachers (35.5%) and 56.6% of civil servants used devices such as a mouse pad, a document stand and foot rest, while only 2.6% of university teachers and 1.2% of civil servants used a neck brace or other similar device (Table 2).

Table 2. Symptoms of complaints of arm, neck, and shoulder among respondents

Presenting Symptoms of CANS	Responses in % University teachers (N=152)		Responses in % Civil servants (N=83)	
	Yes	No	Yes	No
I feel pain in my upper extremity as soon as I finish work.	43.4 %	56.6 %	37.3 %	62.7 %
Disappears awhile after activity.	25.0 %	18.4 %	19.2 %	18.1 %
I feel fatigue and exhaustion in my upper extremity after work.	**55.3 %**	44.7 %	**62.7 %**	37.3 %
Disappears awhile after activity.	44.7 %	9.9 %	42.2 %	20.5 %
I feel stiffness in my fingers after work.	17.1 %	82.9 %	9.6 %	90.4 %
Disappears awhile after activity.	11.8 %	5.3 %	2.4 %	7.2 %
I feel numbness in my fingers after work.	7.9 %	92.1 %	6.0 %	94.0 %
Disappears awhile after activity.	6.6 %	1.3 %	3.6 %	2.4 %
I feel tingling in my fingers after work.	12.5 %	87.5 %	7.2 %	92.8 %

Persists a few hours after activity.	9.2 %	3.3 %	2.4 %	4.8 %
I feel weakness in my upper extremity after work.	13.2 %	86.8 %	7.2 %	92.8 %
Persists a few hours after activity.	11.2 %	2.0 %	6.0 %	1.2 %
I suffer from swelling in my hands after work.	6.6 %	93.4 %	2.4 %	97.6 %
Persists a few hours after activity.	5.9 %	0.7 %	1.2 %	1.2 %
I feel swelling/ stiffness in my upper extremity after work.	4.6 %	95.4 %	7.2 %	92.8 %
I feel continuous pain/ tingling in my upper extremity after work.	12.5 %	87.5 %	6.0 %	94.0 %

The prevalence of complaints of the arms, neck and/or shoulders is higher on the right side of the body for both university teachers and civil servants.

Exploratory factor analysis of the main 6 domains of questions yielded 13 factors. The utility of the individual factors was at least 0.40. Inappropriate items were eliminated. Cronbach's alpha for most factors exceeded the minimum acceptable value of 0.6. Results of exploratory factor analysis are in Table 3.

Three factors were obtained in the body position at work section. The first factor contained three items related to head and trunk position and explained 23.4 % of the total variability. The value of the adjusted item correlations was 0.63–0.9. The second factor also contained three items related to uncomfortable body position and explained 19.3 % of the total variability. The value of the adjusted item correlations was 0.63–0.80. The third factor contained three items related to physical exertion explained 19.0% of the total variability. The value of corrected correlations of individual items was 0.66–0.78.

Two factors were obtained in the work supervision section. The first one contained four items related to decision-making and explained 32.95 % of the total variability. The value of the adjusted item correlations was 0.79–0.81. The second factor contained five items related to the use of skills and new knowledge explained 25.47% of the total variability. The value of the adjusted item correlations was 0.41–0.81.

In the section about the work requirements, one factor were identified, one contained six items related to the time requirements and complexity of work. It explained 56.60 % of the total variability. The value of the adjusted item correlations was 0.64–0.87.

Three factors were obtained in the quality of breaks section. The first contained three items related to body posture during breaks and explained 22.83 % of the total variability. The value of the adjusted item correlations was 0.61–0.84. The second factor contained two items related to break time and explained 22.8 % of the total variability. The value of the adjusted item correlations was 0.83–0.85. The third factor, autonomy of breaks, contained three items and explained 22.7 % of the total variability. The value of the adjusted item correlations was 0.62–0.81.

We got two factors in the working environment (section). The first contained four items related to air quality and explained 43.32 % of the total variability. The value of the adjusted item correlations was 0.69–0.89. The second factor contained three items related to inadequate lighting quality and explained 24.34% of the total variability. The value of the adjusted item correlations was 0.84–0.85.

Two factors were also obtained in the social support section. The first one contained six items related to support from colleagues at work and explained 48.69 % of the total variability. The value of the adjusted item correlations was 0.52–0.81. The second factor contained one item related to disturbing colleagues and explained 15.94 % of the total variability. The value of the adjusted item correlations was 0.81.

Table 3. Exploratory factor analysis

Factor	Cronbach alpha coeficient	Value of corrected correlations of individual items
Body position at work section head and trunk position		
1. head and trunk position	0.78	0.63–0.9
2. uncomfortable body position	0.80	0.65–0.75
3. physical exertion	0.77	0.66–0.78
Work supervision		
1. decision-making	0.85	0.79–0.81
2. use of skills and new knowledge	0.67	0.41–0.81
Work requirements		
1. time requirements and complexity of work	0.84	0.64–0.87
Breaks section		
1. body posture during breaks	0.78	0.61–0.84
2. break time	0.78	0.83–0.85
3. autonomy of breaks	0.71	0.62–0.81
Working environment		
1. air quality	0.81	0.69–0.89
2. inadequate lighting	0.74	0.84–0.85
Social support		
1. support from colleagues at work	0.82	0.52–0.81
2. disturbing colleagues		0.81

Discussion

The highest prevalence anywhere on the upper extremities, neck, shoulders and wrists, similar to our study, is also found in tree Slovenian studies [8-10]. Authors from the Netherlands, Sudan, Greece, Sri Lanka, Selangor, Kuala Lumpur and Niger have also reported similar results. The prevalence of CANS in at least one area of the upper extremity was lower in all four studies than in ours, ranging from 0.55 to 0.64 [4, 13-17], while in our study it was 0.72 in university teachers and 0.60 in civil servants.

Complaints are more often expressed on the right side, which is also found by other researchers [4, 8-10, 13, 15, 17, 18]. This is related to the fact that most of the participants are right-handed. University teachers spend a lot of their working time (6.2 hours) sitting at a computer, preparing for teaching, research and other tasks. This can lead to various problems or illnesses at the end of the working day. More than half of the participants (55.3%) experience fatigue in the upper extremity, which in most cases disappears after rest. Upper extremity pain was also reported by 43.4%, but in two-fifths of cases the pain did not disappear after rest. Finger numbness is reported by 17.1% of university teachers and upper limb weakness by 13.2%, but most of these problems disappear with rest. Public administration workers, on the other hand, spend an average of 7.4 hours sitting in front of a computer. As a result, almost 63% of them experience fatigue in their upper limbs, and a third have pain that does not go away. Pain in the upper extremity is experienced by 37.3% and almost half of them do not get rid of it at the end of the working day. Similar results are also reported in tree Slovenian studies [8-10], but with lower percentages of CANS. It should be noted that they studied office workers and it was expected that CANS would be more prevalent in their studies than in those of university teachers.

Preventive measures to reduce the incidence of the disease among university teachers and civil servants are organisational (extra breaks, flexible working hours, etc.), technical (ergonomic design of the work environment, training in manual handling, etc.) and personal (more physical activity to reduce neck, shoulder and arm pain; better eating habits, stopping smoking and excessive alcohol consumption, improving communication and interpersonal relationships at work, etc.). A combination of all these measures and different multidisciplinary approaches is needed to be successful [19].

It should be noted that there are only a few published longitudinal studies designed to evaluate the impact of interventions, in particular those aimed at working in higher education. Bruls et al [7] find low rates of CANS at baseline and relatively small differences between baseline and endline measurements after the inclusion of interventions in a cohort study (duration one year, four measurements) of the whole university population (students, higher education teachers and administrators). However, they point out that the subgroup with the greatest problems was absent from work and it was not possible to obtain measurements.

An exploratory factor analysis was carried out in two Slovenian private companies. The research of 102 employees extracted thirteen factors, twelve of which showed an association with neck and upper limb disorders [20]. Another study reported the association of four of the twelve factors with neck pain in a company with 65 subjects [10]. Both studies found a positive association between the prevalence of CANS in the neck region and an uncomfortable body position at work. Some foreign studies that report a negative association between skill use and wrist CANS, as skill use is mentioned as a buffering factor [21], but Plemelj Mohorič and Vesenjak [20] find positive associated. In a review of articles, some authors [22, 23] state that there is insufficient robust evidence for an association between individual risk factors and upper limb musculoskeletal disorders. Turci et al [1] confirms that incorrect posture and poor task control are major contributors to the occurrence of CANS in the workplace. Many experts, including sanitary engineers and occupational therapists, are involved in assessing workplace risks, eliminating hazards and considering preventive measures [24, 25, 26]. The latter combine ergonomic knowledge and appropriate assessment instruments [24].

Conclusion

A survey on the prevalence of CANS among university teachers showed the highest prevalence of CANS in any survey conducted in Slovenia to date. There is a need for a more in-depth study of CANS in the university teacher population. Future research should also focus on investigating the effectiveness of these interventions, using longitudinal studies with a larger sample.

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PROBLEMI SA RUKAMA, VRATOM I/ILI RAMENIMA KOD UNIVERZITETSKIH NASTAVNIKA I ZAPOSLENIH U JAVNOJ UPRAVI U SLOVENIJI

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Sažetak. Rad sa računarom često je povezan sa sjedenjem i problemima u rukama, vratu i/ili ramenima, koji se najčešće javljaju kod kancelarijskih radnika. Tegobe u rukama, vratu i/ili ramenima su mišićno-koštani poremećaji koji nisu rezultat akutne povrede ili sistemske bolesti. Svrha rada je utvrditi prevalenciju problema s rukama, vratom i/ili ramenima među zaposlenima u Sloveniji, koji uglavnom rade za računarom. Maastrichtski upitnik gornjih ekstremiteta korišten je za analizu tipičnih problema sa rukama, vratom i/ili ramenima u online alatu 1KA. Učesnici su bili univerzitetski nastavnici i službenici javne uprave koji rade sa računarima. Ispitujući prevalenciju problema sa rukama, vratom i/ili ramenima među univerzitetskim nastavnicima (N = 152) i zaposlenima u javnoj upravi (N = 83), prevalencija je niža kod kancelarijskih radnika nego kod univerzitetskih nastavnika. Najveća prevalencija među univerzitetskim nastavnicima je u vratu (57%), ramenima (49%) i zglobovima (31%), dok je među službenicima javne uprave prevalencija u vratu 49%, u ramenima 46%, a u zglobovima 31%. Prevalencija tegoba gornjeg dijela ruku, vrata i/ili ramena u slovenačkim istraživanjima slična je rezultatima stranih studija i češća je na desnoj strani tijela. Dokazi o povezanosti između pojedinačnih faktora rizika i problema sa rukama, vratom i/ili ramenima nisu dovoljno jaki. Poremećaji mišićno-koštanog sistema povezani sa previše rada na kompjuteru predstavljaju javnozdravstveni problem. Uprkos propisima o radu sa ekranom, slovenačke kompanije pokazuju mnoga odstupanja u dizajnu radnog okruženja. Rezultati našeg istraživanja pokazuju na potrebu poduzimanja mjera za smanjenje problema povezanih s kompjuterom i očuvanje zdravlja. Longitudinalna studija bi bila potrebna kako bi se dalje istražili faktori rizika i prevalencija problema sa rukama, vratom i/ili ramenima.

Ključne riječi: rad sa računarom, pritužbe na ruku, vrat i/ili rame, faktori rizika, ergonomija