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Original Article

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A validation study and psychometrical evaluation of the Maastricht Upper Extremity Questionnaire (MUEQ) for the Greek-speaking population

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Abstract

Objectives: The Maastricht Upper Extremity Questionnaire (MUEQ) is a tool to examine the physical, psychological and environmental risk factors in the work place that may contribute to the prevalence of complaints of arm, neck and shoulder. The aim of this study was to develop a Greek language version of the MUEQ and to assess its psychosocial parameters. **Methods:** The MUEQ was translated into the Greek language and culturally adapted. Exploratory factor analysis was used to analyze interrelations among the questionnaire items and for each of the seven domains two factors were given, thus resulting in the identification of a total of 14 factors. **Results:** The tool was handed out to 455 computer office workers (179 males, 276 females) with a mean age of 37.4 (SD 9.2). Factor analysis and Cronbach's alpha coefficient indicate that the results are generalizable to the population and the total scale has high internal consistency. The results showed that in the last year, 35.8% of respondents experienced upper extremity pain, specifically in the neck or the shoulders. **Conclusions:** The Greek version of the MUEQ appears to be a valid tool for the assessment of risk factors related to pain in the upper extremity among Greek computer office workers.

Keywords: Ergonomics, Repetitive Strain Injury, Public Health, Musculoskeletal, Workplace

Introduction

Upper extremity pain has been the subject of a great deal of attention in the mid-1980s for worker health and workplace safety and is a frequently occurring condition in both the working and nonworking populations[3,4]. In modern societies, upper extremity disorders constitute a major problem, due to the impact on patients and costs for sick leave and health care[5]. Numerous studies in recent years show that intense and constant hand pain is a major cause of workers' suffering and workers' compensation[6]. The second most frequent source of workplace injuries and illnesses in 2007 was worker motion or position[7]. A universally accepted definition of complaints of arm, neck, shoulder (CANS), developed by a Delphi consensus strategy is used to allow comparison of scientific research of upper extremity musculoskeletal disorders[8]. It is very important to identify the risk factors for the development of CANS.

Data from all over the world, especially from developed countries, have been collected and studies show that a large group of office workers might be at risk for hand, arm, shoulder and neck pain[9]. In Nigeria, with an increase in the number of computer users, complaints of musculoskeletal pain have also increased[10]. So, it appears that the physical and the psychosocial factors related to computer office work are similar between cultures[2]. Inflammatory and degenerative conditions develop over an extended period of time, rather than after an instantaneous exposure and affect soft tissues, muscles, tendons, nerves, ligaments, joints and blood vessels[11,12].

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Psychosocial factors may obviously be influenced by social or cultural factors[13]. For example, a study in Sweden demonstrated that dissatisfaction at work with the management and poor physical and psychosocial environment result in musculoskeletal symptoms[14]. Moreover, workload, pressure for time and need for an increase in productivity are potential risks for the health of the workers[15,16]. More concretely, preliminary findings have suggested that work style, meaning the interaction of psychosocial and physical risk factors in the work environment, may serve as the bridge for understanding the interaction between job stressors and ergonomic factors and how it impacts upper extremity outcomes[17].

For the purposes of assessing the risk factors associated with CANS, the Maastricht Upper Extremity Questionnaire (MUEQ) has been employed. The psychometric properties of the Dutch and Arabic version of the MUEQ have already been reported[1,2], but they have not been independently verified in the Greek population. The present study describes the translation into Greek of the MUEQ and its validation in a Greek-speaking population. Furthermore, the prevalence of CANS and a comparison of this prevalence to other populations are also presented.

Materials and methods

The MUEQ tool

The MUEQ addresses the occurrence, nature and possible work-related physical and psychological risk factors of CANS among computer users[1], The MUEQ is the result of the combination of previous tools[1]. In particular speaking, the questions related to the psychosocial factors are based on the Job Content Questionnaire, while the questions related to the physical risk factors at work are based on the Dutch Musculoskeletal Questionnaire[18,19].

The MUEQ consists of 95 questions for which completion time is twenty minutes. The first part of the MUEQ involves socio-demographic characteristics. The question about the amount of hours of work per week has been replaced by the amount of free time one spends on the computer. Moreover, a question about one's weight and height has been added, to allow the calculation of the Body Mass Index (BMI). An extra question in the Greek version of the questionnaire has been added concerning the frequency of use of either the keyboard or the mouse device. Finally, the question of one's name has been excluded to maintain confidentiality and anonymity.

The questionnaire consists of 7 basic sections: (l) work station; (2) body posture during work; (3) job control; (4) job demands; (5) quality of break time (6) work environment and (7) social support.

The final part of the translated questionnaire included items related to the frequency and the nature of the neck and upper arm complaints. At the same time, there were questions involving the clinical nature of the complaints.

Translation

The translation procedure began once the developer was contacted and approved its translation into Greek. The first step of the procedure was the translation of the original Dutch language questionnaire into Greek. It was done according to the criteria of the Scientific Advisory Committee of the Medical Outcomes Trust[20]. More specifically, it was done with a forward and backward translation procedure. Following the recommended protocol, three independent translators, namely, a Greek language teacher E.L., a Dutch language teacher E.P. and a specialist ergo therapist P.B. translated the questionnaire into Greek. They were all native speakers of Greek with an advanced command of the Dutch language. Then, a meeting of experts followed to consider the above translations and to create a common questionnaire. The experts were an orthopedic specialist, an anesthesiologist, a psychiatrist, physiotherapists and psychologists. Most of them were from the Nikaia General Hospital, Attiko Hospital, 401 General Military Hospital of Athens and the Medicine school of the Athens University.

Next, a native Dutch speaker S.L., blinded to the original version, retranslated the re-conciliated Greek version (backward translation). Afterwards, all the necessary corrections and revisions were made, by the committee of experts, who convened again to form the Greek version of the Musculoskeletal Upper Extremity Questionnaire (MUEQ.Gr.v0).

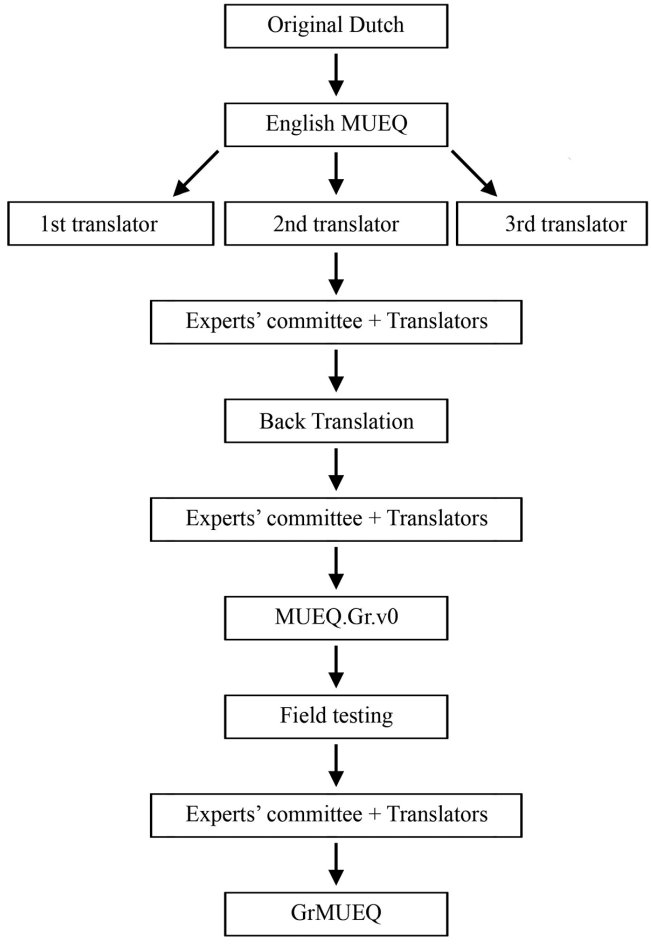

Figure 1.

The next step was to distribute the translated questionnaire to a small number (8) of computer office workers. At this stage, brief interviews were conducted with the workers so that they could comprehend the questions. The aim of the interview was to discover and pinpoint any mistakes or misunderstandings and to make suggestions wherever it was needed. Finally, after taking the comments of the participants into consideration, the committee of experts made the final necessary changes to create the final Greek version of the Musculoskeletal Upper Extremity Questionnaire (MUEQ.Gr,v1) (Figure 1). The Greek Version of the MUEQ (MUEQ.Gr,v1) is shown in the Appendix 1.

Validation

Study population and data collection

The research protocol was approved by the local ethics committee and scientific board of the General District Hospital of Nikaia. Participants were recruited voluntarily and the process was confidential and anonymous. Participants were excluded on the basis of the following criteria: 1) pensioners; 2) students doing their professional practice; 3) severe psychiatric or behavioral disorders[2]; and 4) prior injury of the upper extremity[2]. The participants were also meant to speak the Greek language fluently and should have lived and worked in different places in Greece in order to be a sample representative. They all shared similar working conditions and they had to perform jobs with a variety of computer tasks.

The fieldwork period began on fourth of May 2009, with the distribution of 600 self-administered questionnaires in the workplace. Participants filled out the questionnaires and returned them by 20th June, which was set as the latest return day. Completed and returned questionnaires were coded and entered in the SPSS 17.0 software program and data were cleaned and made ready for statistical analyses.

Factor analysis

The exploratory factor analysis (EFA) was used to analyze interrelations among the items of the questionnaire. Due to the large number of questions, the exploratory factor analysis was the best way to recognize and explain the dimensions of the seven sectors[1]. A Principal Component Analysis (PCA) with orthogonal Varimax rotation was conducted, to assess the internal structure of the measure. The number of factors retained, was derived by considering the magnitude of the eigenvalues (greater than 1) and the proportion of variance extracted. Items having complex structure -when one item has poor loadings (less than 0.4) on more than one component were removed from the analysis. If the results indicated more than two factors, a forced two-factor analysis was performed[1].

Reliability and internal consistency

The internal consistency of the factors was investigated with the use of Cronbach's alpha coefficient (Cronbach, 1951)[21]. Cronbach's a is a measure of how well each individual item in scale correlates with the sum of the remaining items. An alpha coefficient equal to or greater than 0.7 was considered acceptable and was deemed to indicate good reliability[22]. Optimal item-total correlation was considered to be between 0.2 and 0.5[23]. Items with scores falling out of this range were examined for possible exclusion from the MUEQ[24].

Gender	**Male (n=179)**	**Female (n=276)**
	39.3%	60.7%
Age		
20-35	48.6%	53.3%
36-50	40.8%	37.3%
51-65	10.6%	9.4%
Occupation		
Bank	60.3%	59.8%
Military	7.3%	4.3%
Private	25.1%	28.3%
Public	7.3%	7.6%
Number of working hours with computer/Day		
Until 7 hours	43.0%	41.7%
7-8 hours	44.7%	48.2%
more than 8 hours	12.3%	10.1%
Free-time with computer/Day		
0-2 hrs	73.2%	89.5%
2-4 hrs	20.1%	6.9%
4-6 hrs	6.1%	2.9%
6-8 hrs	0.6%	0.7%

Table 1. Descriptive characteristics of the study population (n=455).

Performance of cross-validation

In order to test the stability of the factor structure and the generalizability of findings from a principal component analysis cross-validation was carried out. We split the sample randomly into two sub samples, did the principal component analysis and internal consistency analysis on each half and compared these results to the total data set. If the communalities and the factor loadings were the same on the analysis on each half and the full data set, we had evidence that the findings were generalizable and valid because, in effect, the two analyses represented a study and a replication.

Calculation of CANS prevalence rate

Prevalence rates of complaints over the past twelve months that lasted for at least one week were computed for males and females and for each upper musculoskeletal body region (neck, shoulder, upper arm, elbow, lower arm, wrist and hand) including 95% confidence intervals (CI).

Results

Demographic Characteristics of the Study Population

455 men and women out of the 600 responded to the baseline questionnaire, which resulted in a response rate of 75.8%. 60.7%

Table 2. Factor analysis.

Domain	Questions	Factor 1	Factor 2
Work Station		**Office equipment**	**Computer position**
	Desk at work has suitable height	**0.71**	0.07
	I can adjust my chair height	**0.60**	0.02
	When I use the mouse my arm is supported	0.28	0.32
	The chair I use during work supports my lower back	**0.60**	0.04
	Keyboard is placed directly in front of me	0.04	**0.85**
	Screen is placed directly in front of me	0.06	**0.87**
	I have enough space to work at my desk	**0.62**	0.27
Eigenvalue		1.69	1.66
% of Variance		24.1	23.6
Body Posture		**Head and body posture**	**Awkward body posture**
	I keep a good work posture	**-0.55**	0.00
	I sit for long hours in one position	0.10	**0.68**
	I sit with lifted shoulders	0.05	0.38
	Sitting in awkward posture	**0.65**	0.35
	Performing repetitive tasks	0.22	**0.69**
	Job physically exhausting	0.37	0.33
	My hand is placed in a straight line with my lower arm	-0.37	**0.49**
	My head is bent	**0.50**	0.35
	Head is twisted towards the left or right	**0.65**	0.07
	Trunk is twisted towards the left or right	**0.63**	-0.03
	Trunk is in asymmetrical position	**0.77**	0.11
Eigenvalue		2.72	1.69
% of Variance		24.7	15.4
Job Control		**Decision authority**	**Development of creative skills**
	I decide how to perform my job task	**0.80**	0.13
	I participate with others in decision	**0.60**	0.30
	I decide my own task changes	**0.77**	0.06
	I determine the time & speed of job tasks	**0.73**	0.21
	I solve work problems by my self	**0.67**	0.15
	My work develop my abilities	0.25	**0.76**
	At work I learn new things	0.12	**0.85**
	Creative in my work	0.09	**0.72**
	I undertake different tasks in my work	0.18	**0.62**
Eigenvalue		2.70	2.37
% of Variance		30.0	26.4
Job Demands		**Task complexity**	**Work pressure**
	Work under extensive pressure	0.45	**0.63**
	Difficulty in finishing my job tasks	**0.85**	0.14
	I take extra hours to finish	**0.88**	0.17
	No enough time to finish my job	**0.85**	0.16
	I speed to finish my tasks	-0.02	**0.89**
	I find my work tasks difficult	**0.60**	0.20
	I have too many job tasks	0.02	**0.46**
Eigenvalue		2.95	1.51
% of Variance		42.2	21.5
Break time		**Autonomous management of free time**	**Alternative kind of work other than the computer**
	I can plan my work breaks	**0.90**	0.04
	I can divide my work time	**0.83**	0.09
	I can decide when to take a break	**0.89**	0.06
	I alternate my body posture	0.33	**0.45**
	I alternate in my job task	0.07	**0.82**
	I perform job task without computer	0.04	**0.75**
	After two hours I take a break for 10 min.	**0.62**	0.21
	Work breaks are sufficient	**0.80**	0.12
Eigenvalue		3.52	1.52
% of Variance		43.9	18.9

Table 2. (cont.)

Work environment		**Work environment**	**Influence of working conditions**
	Work environment is good	**0.71**	-0.06
	Air is too dry	-0.48	**0.53**
	Air is too cold	-0.33	**0.47**
	There is unwanted air	**-0.67**	0.40
	There is fresh air	**0.68**	-0.17
	Work environment is noisy	-0.30	**0.47**
	Work place is too bright	**0.64**	0.38
	Gaze at the computer screen	0.20	**0.61**
	Computer screen reflects the office lights	-0.05	**0.53**
Eigenvalue		2.29	1.71
% of Variance		25.4	19.0
Social support		**Social support**	**Work flow**
	The work flow goes smoothly	-0.01	**0.89**
	I can ask & enquire in my work	0.35	**0.59**
	Work tasks depend on other colleagues	0.38	0.00
	Work atmosphere is comfortable	0.36	**0.68**
	I find support from colleagues	**0.72**	0.32
	I find support from supervisors	**0.77**	0.27
	My colleagues are friendly	**0.71**	0.27
	My supervisors are friendly	**0.80**	0.23
Eigenvalue		2.66	1.91
% of Variance		33.3	23.9

(n=276) were women. 51.4% of the total sample was aged between 20 and 35 years, 48.6% of the males and 53.3% of the females were also in this age group and 40.8% of males and 37.3% of the females was aged between 36 and 50 years old. In addition, 60.1% of the total sample, were bank clerks, 26.7% private sector workers, 7.4% civil servants and 5.8% military personnel. The percentage of respondents working 7-8 hours with computer per day was approximately the same among female women and male men, because of the similar working conditions. Of the male participants 26.8% spent more than 2 hours per day of their free time with computer compared to 10.5% of the female participants, means that men spent more of their free time daily in a computer than women (Table 1).

Results of cross-validation

We have done the same analysis on two separate sub-samples of half cases and obtained the same results. Since no important differences were found in the results we only present results of the factor analysis as applied to the total sample (Table 2). This validation analysis supports a finding that the results of this principal component analysis are generalizable to the population represented by this data set.

Psychometric characteristics of the MUEQ

Cronbach's alpha coefficient for the total number of items was 0.74, which indicates that the total scale has high internal consistency. Also we observed that it was not necessary to delete any of the items to improve the reliability score of the test, however items having complex structure need to be removed because they could not be categorized to a factor.

Furthermore, after the results from the factor analysis which indicated that each section included two factors accounting for more than 40% of variance, we find that some of the factors showed an alpha below 0.65 and showed suboptimal item-total correlation (either below 0.2 or above 0.5). However, Cronbach's alpha did not improve sufficiently when items were removed to justify the omission of items from the scale. Items which are loading poor on both factors were erased. The results of the internal consistency for the 14 factors and item-total correlations are presented in table 3.

The **Work Station** section consists of 6 questions (items). The factor loading study showed that the question "When I use the mouse device, my arm is supported by the table" loads poorly in both factors and so it was erased because it could not be categorized. The first factor "*office equipment*" consisted of 4 items, accounted for 24.1% of the total variance and got a Cronbach's alpha coefficient 0.54 (not acceptable); while values of item-total correlations varied between 0.29 to 0.37, which were in the optimal space. The second factor "*computer position*" consisted of 2 elements, accounted for 23.6% of the total variance and got a Cronbach's alpha coefficient 0.70 (acceptable); and the item-total correlations was 0.54.

The **Body Posture** section consists of 9 questions (items). The factor loading study showed that two questions, namely: "For more than two hours per day I sit with lifted shoulders" and "I find my job physically exhausting" were poor loaders on both factors and were subsequently excluded. The first factor "*head and body posture*" consisted of 6 elements, accounted for 24.7% of the total variance and got a Cronbach's alpha coefficient 0.74 (acceptable); while values of item-total

Section	Factor	Items	%Var	Alpha	ITC
Work Station (6)	Office equipment (4)	10, 11, 13, 16	24.1	0.54	029-0.37
	Computer position (2)	14,15	23.6	0.70	0.54
Body Posture (9)	Head and body posture (6)	17, 20, 24-27	24.7	0.74	0.35-0.61
	Awkward body posture (3)	18, 21, 23	15.4	0.58	0.13-0.30
Job Control (9)	Decision authority (5)	28-32	30.0	0.79	0.49-0.65
	Development of creative skills (4)	33-36	26.4	0.75	0.44-0.67
Job Demand (7)	Task complexity (4)	38-40, 42	42.2	0.85	0.46-0.79
	Work pressure (3)	37, 41, 43	21.5	0.60	0.33-0.47
Break Time (8)	Autonomous management (5)	44 - 46, 50, 51	43.9	0.89	0.54-0.80
	Alternative, no computer (3)	47-49	18.9	0.52	0.28-0.45
Work Environment (9)	Work environment (4)	52, 55, 56, 58	25.4	0.64	0.30-0.49
	Impact of working conditions (5)	53, 54, 57, 59, 60	19.0	0.50	0.18-0.35
Social Support (8)	Social support (4)	65-68	33.3	0.83	0.63-0.69
	Work flow (3)	61, 62, 64	23.9	0.66	0.43-0.50

* In parentheses the number of items per section (in the first column) and the number of items per factor (in the second column), after removing the variables which were poor loaders (<0.4) in both factors.
** Underlined alphas are the ones that were not acceptable (not reached the preset limit of 0.70).

Table 3. Internal consistency and item total correlations of the fourteen factors.

correlations varied between 0.35 to 0.61. The second factor "*awkward body posture*" consisted of 3 elements, accounted for 15.4% of the total variance and got a Cronbach's alpha coefficient 0.58 (not acceptable); and the item-total correlations were 0.13 to 0.30.

The **Job Control** section consists of 9 questions (items). The first factor "*decision authority*" consisted of 5 elements, accounted for 30.0% of the total variance and got a Cronbach's alpha coefficient 0.79 (acceptable); while values of item-total correlations varied between 0.49 to 0.65. The second factor "*development of creative skills*" consisted of 4 elements, accounted for 26.4% of the total variance and got a Cronbach's alpha coefficient 0.75 (acceptable); and the item-total correlations were 0.44 to 0.67.

The **Job Demand** section consists of 7 questions (items). The first factor "*task complexity*" consisted of 4 elements, accounted for 42.2% of the total variance and got a Cronbach's alpha coefficient 0.85 (acceptable); while values of item-total correlations varied between 0.46 to 0.79. The second factor "*work pressure*" consisted of 3 elements, accounted for 21.5% of the total variance and got a Cronbach's alpha coefficient 0.6 (not acceptable); and the item-total correlations were 0.33 to 0.47.

The **Break Time** section consists of 8 questions (items). The first factor "*autonomous management of free time*" consisted of 5 elements, accounted for 43.9% of the total variance and got a Cronbach's alpha coefficient 0.89 (acceptable); while values of item-total correlations varied between 0.54 to 0.80. The second factor "*alternative kind of work not involving a computer*" consisted of 3 elements, accounted for 18.9% of the total variance and got a Cronbach's alpha coefficient 0.52 (not acceptable limit); and the item-total correlations were 0.28 to 0.45.

The **Work Environment** section consists of 9 questions (items). The first factor "*work environment*" consisted of 4 elements, accounted for 25.4% of the total variance and got a Cronbach's alpha coefficient 0.64 (not acceptable); while values of item-total correlations varied between 0.30 to 0.49. The second factor "*impact of working conditions*" consisted of 5 elements, accounted for 19.0% of the total variance and got a Cronbach's alpha coefficient 0.5 (not acceptable); and the item-total correlations were 0.18 to 0.35.

The **Social Support** section consists of 8 questions (items). The factor loading study showed that the question "My work tasks depend on other colleges" loads poorly in both factors and so it was erased because it could not be categorized. The first factor "*social support*" consisted of 4 elements, accounted for 33.3% of the total variance and got a Cronbach's alpha coefficient 0.83 (acceptable); while values of item-total correlations varied between 0.63 to 0.69. The second factor "*work flow*" consisted of 3 elements, accounted for 23.9% of the total variance and got a Cronbach's alpha coefficient 0.66 (not acceptable); and the item-total correlations were 0.43 to 0.50.

Prevalence of CANS

Prevalence rate of CANS in Greece indicated that 64% of the respondents mentioned at least one complaint in the past twelve months, of which 54% were male and 70% female. The most common problems in the past year, according to the results, were 55.8% for the neck, 40% for the shoulder, 39.8% for the wrists, while less common were complaints for the arms at 23.5%, the elbows at 14.5% and the lower arms at 12.3%. Further, the proportion of participants with complaints of the various upper extremity body regions was greater for females than for males (Table 4). The difference in the prevalence rates for wrists and hand complaints between male and female were statistically significant.

Localization of complaints	Total number of subjects with complaints	Total prevalence (95% CI) (n=455)	Male prevalence (95% CI) (n=179)	Female prevalence (95% CI) (n=276)
Neck	254	0.56 (0.51, 0.60)	0.46 (0.39, 0.54)	0.62 (0.56, 0.68)
Shoulder	182	0.40 (0.35, 0.45)	0.31 (0.24, 0.38)	0.46 (0.40, 0.52)
Upper arm	107	0.24 (0.20, 0.27)	0.18 (0.12, 0.24)	0.27 (0.22, 0.32)
Elbow	66	0.15 (0.11, 0.18)	0.13 (0.08, 0.18)	0.16 (0.11, 0.20)
Lower arm	56	0.12 (0.09, 0.15)	0.07 (0.03, 0.10)	0.16 (0.12, 0.20)
Wrist	181	0.40 (0.35, 0.44)	0.28 (0.22, 0.35)	0.47 (0.41, 0.53)
Hand	176	0.39 (0.34, 0.43)	0.26 (0.19, 0.32)	0.47 (0.41, 0.53)
At least one complaint	290	0.64 (0.59, 0.68)	0.54 (0.46, 0.61)	0.70 (0.64, 0.75)

Table 4. Prevalence rates of upper extremity musculoskeletal complaints during the previous year.

Complaints †,‡‡	Greece This study	Dutch Eltayeb, 2007	Arabic Eltayeb, 2008
At least one	291(64.0)	145(55.0)	175(70.0)
Neck	254 (55.8)	89 (33.7)	161 (64.4)
Shoulder	182 (40.0)	81 (30.6)	103 (41.2)`
Upper arm	107 (23.5)	32 (12)	82 (32.8)
Elbow	66 (14.5)	16 (6)	48 (19.2)
Lower arm	56 (12.3)	21 (8)	53 (21.2)
Wrist	181 (39.8)	21 (8)	74 (29.6)
Hand	176 (38.7)	30 (11)	77 (30.8)
Male	179 (39.3)	133 (50.4)	163 (65.2)
Female	276 (60.7)	131 (49.6)	87 (34.8)

† n (%); ‡ mean (SD); ‡‡ percentages (n/455), (n/264), (n/250)
sum up >100% because many people had more than one complaints.

Table 5. Complaints of this Greek sample compared to other studies.

Discussion

The aim of the present study was to translate and validate a reliable and useful research tool to measure the prevalence of upper extremity pain among computer users and assess the associated risk factors.

If the translation and adaptation shows good psychometric properties, it can be used in international comparative studies. Although, if the target group is similar to the original population a simple translation can be successful. In general, cultural differences did not hinder the use of the translated version among the Greek cohort. Thus, on the one hand we can assume that physical and psychosocial factors related to computer office work are not perceived differently by different cultures and on the other hand that the scales identified by the factor analyses in this study are indeed risk factors for the development of CANS in computer workers[2].

We followed closely the instrument translation/validation methodology[22,25]. The wide number of people involved in the translation, back-translation, consulting and pilot process ensures that the original content has been successfully translated into the destination language. Also, because of the Dutch and the Greek cultures are different; cultural adaptations during translation were essential.

Factor analysis plays a major role in construct validation[22]. When Principal Component Analysis was conducted for every section of the questionnaire, 14 factors were found, two for each section accounting for approximately 50% of the variance. The reliability and the internal consistency of the factors were confirmed with the measure of Cronbach alpha. The Cronbach's alpha coefficient in the Greek version of the MUEQ was between 0.52 and 0.89. In the Dutch version, Cronbach's alpha ranged from 0.54 to 0.85, while in the Arabic version it was from 0.48 to 0.94[1,2]. Furthermore, due to the representative sample and the high response rate (79.5), we have tried to accurately examine the measurement properties of the MUEQ, and the cross-validation results indicate that, the findings are generalizable and valid.

The Greek sample shows that neck, shoulder and wrist complaints are reported more frequently than complaints in any

other upper body regions. The comparison between three similar studies in different cultures shows that the proportions of participants with at least one complaint of the various upper extremity body regions was slightly greater for Greece (64%) and Sudan (70%) than Dutch (55%). Moreover, for the Dutch population and for cases in a country with Arabic population, namely the Sudan, similarly neck and shoulder complaints are more frequently mentioned (Table 5)[1,2].

Similar results with our study, about the most commonly reported complaints were found by Huisstede et al, in a study on the Dutch population[4]. More specifically, the most commonly reported complaints for both the Greek and the Dutch population were for the shoulders and the neck, while the least reported ones were for the wrists, hands, and elbow. Similarly, in another study, Jensen reported more neck than wrist/hand complaints.

In the present study, it was also found, that more complaints were reported by women than by men[26]. In Europe, the musculoskeletal disorders of the neck and the upper extremity constitute a major problem in the work place especially among older women[27]. Also, according to Jensen women are more likely to have symptoms than men[26]. It is true that women express their complaints about musculoskeletal pain more frequently than men, especially as far as upper extremity pain is concerned[28]. One possible explanation for this difference is that women have, often, additional stress from unpaid work such as housekeeping and childcare[29]. There are also data which confirm that psychological and social factors are related to the differences between the sexes[30].

Furthermore, it has been generally suggested that the designing of the workplace and the wrong body postures can affect the risk factors for the development of musculoskeletal disorders. When the workplace is not properly designed, the risks for the development of symptoms are due to the hurried and unnatural body postures, which implicate and aggravate the stabilizing muscles[26].

Moreover, in a systematic review it has been found that, high job demands, low decision latitude, time pressure, mental stress, job dissatisfaction, high workload, and lack of social support from colleagues and superiors were suggested as risk factors for upper extremity musculoskeletal disorders[31,32]. In the current study seven variables were tested including job demands (task complexlty and work pressure), job control (decision authority and development of creative skills) and social support (support between coworkers and supervisors and work flow). The results found support for the association between job strain and developing upper extremity symptoms or exacerbate and maintain pre-existing symptoms[17,33].

In conclusion, the results of the study show that the Greek conversion of the MUEQ is a reliable and valid tool for the determination of possible risk factors in the workplace for the incidence of CANS among computer office workers in Greece. This questionnaire can be used as a tool of research for the health professionals so that they can identify which working groups are in need of a more analytical and comprehensive ergonomic approach. Further evaluation of psychometric parameters of the questionnaire would prove to be equally useful for other groups of the population. However, further work is needed to improve intervention strategies, that integrate psychosocial and physical risk factor reduction to improve upper extremity health and function among workers.

Authors' Contributions

E. Bekiari, G. Lyrakos and I. Dimoliatis developed the validation and translation and worked on all aspects of the procedure. K. Chanopoulos conducted the statistical analysis. D. Damigos and V. Mavreas real and approved the final manuscript.

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Appendix 1

The Department of Social Medicine and Mental Health of the School of Medicine of Ioannina is conducting research on the use of the computer and upper extremity pain. We kindly request you fill out the following questionnaire. Its completion is strictly anonymous and the content of the information is confidential. The purpose of the questionnaire is purely for research reasons.

We thank you for your cooperation.

Γενικές Πληροφορίες:

1.	Φύλο	□ Α	□ Θ
2.	Ηλικία – Βάρος – Ύψος	_____ ετών	_____ κιλά
			_____ εκ.
3.	Επάγγελμα	_____	
4.	Ποιά είναι η εργασιακή σας θέση;	_____	
5.	Πόσο καιρό δουλεύετε σε αυτή τη θέση;	_____ έτη και _____ μήνες	
6.	Πόσες ημέρες δουλεύετε την εβδομάδα; (υπερωρίες δεν συμπεριλαμβάνονται)	_____ μέρες	
7.	Πόσες ώρες τις εργάσιμες ημέρες δουλεύετε στον υπολογιστή;(υπερωρίες δεν συμπεριλαμβάνονται)	_____ ώρες	
8.	Πόσες ώρες στον ελεύθερο χρόνο χρησιμοποιείτε τον υπολογιστή;	_____ ώρες	
9.	Όταν δουλεύω στον υπολογιστή χρησιμοποιώ πιο συχνά:	□ το ποντίκι □ το πληκτρολόγιο □ και τα δυο εξίσου	

“Το γραφείο εργασίας μου”

10. Το γραφείο μου στην εργασία έχει κατάλληλο ύψος.	□ Όχι □ Ναι
11. Μπορώ να προσαρμόσω το ύψος της καρέκλας μου.	□ Όχι □ Ναι
12. Όταν χρησιμοποιώ το ποντίκι, το χέρι μου στηρίζεται στο γραφείο.	□ Όχι □ Ναι
13. Η καρέκλα που χρησιμοποιώ στην εργασία μου στηρίζει την οσφυϊκή μοίρα της σπονδυλικής στήλης (την μέση μου).	□ Όχι □ Ναι
14. Το πληκτρολόγιο είναι τοποθετημένο ακριβώς μπροστά μου.	□ Όχι □ Ναι
15. Η οθόνη είναι τοποθετημένη κατευθείαν μπροστά μου.	□ Όχι □ Ναι
16. Έχω αρκετό χώρο στο γραφείο μου στη δουλειά.	□ Όχι □ Ναι

“Η Στάση του Σώματός μου”

	Πάντα	Συχνά	Μερικές φορές	Σπάνια	Ποτέ
17. Κατά την διάρκεια εργασίας μου πιστεύω ότι διατηρώ καλή στάση στο σώμα μου.	□	□	□	□	□
18. Στη δουλειά κάθομαι για αρκετές ώρες στην ίδια στάση.	□	□	□	□	□
19. Για περισσότερες από δύο ώρες την ημέρα κάθομαι με ανυψωμένους (σφιγμένους) τους ώμους.	□	□	□	□	□
20. Κατά τη διάρκεια της εργασίας μου κάθομαι σε άβολη στάση.	□	□	□	□	□
21. Στη δουλειά εκτελώ επαναλαμβανόμενες κινήσεις.	□	□	□	□	□

22. Βρίσκω τη δουλειά μου σωματικά εξοντωτική.	□	□	□	□	□
23. Όταν πληκτρολογώ ο καρπός μου βρίσκεται σε ευθεία γραμμή με το αντιβράχιο (αγκώνα).	□	□	□	□	□
24. Όταν δουλεύω το κεφάλι μου βρίσκεται σε κάμψη.	□	□	□	□	□
25. Όταν δουλεύω το κεφάλι μου στρίβει αριστερά και δεξιά.	□	□	□	□	□
26. Όταν δουλεύω ο κορμός στρίβει αριστερά και δεξιά.	□	□	□	□	□
27. Όταν δουλεύω ο κορμός μου βρίσκεται σε ασύμμετρη στάση	□	□	□	□	□

"Ελεγχος Εργασίας"

	Πάντα	Συχνά	Μερικές φορές	Σπάνια	Ποτέ
28. Εγώ επιλέγω τον τρόπο με τον οποίο θα εκτελέσω τα καθήκοντα στην εργασία μου.	□	□	□	□	□
29. Συμμετέχω με άλλους στην ανάληψη αποφάσεων.	□	□	□	□	□
30. Επιλέγω από μόνος μου τις αλλαγές που θέλω να κάνω στην εργασία μου.	□	□	□	□	□
31. Καθορίζω τον χρόνο και την ταχύτητα εκτέλεσης των καθηκόντων της εργασίας μου.	□	□	□	□	□
32. Επιλύω μόνος μου τα προβλήματα στην εργασία μου.	□	□	□	□	□
33. Η εργασία μου, μού αναπτύσσει τις ικανότητές μου.	□	□	□	□	□
34. Στη δουλειά μου μαθαίνω νέα πράγματα.	□	□	□	□	□
35. Πρέπει να είμαι δημιουργικός στην δουλειά μου.	□	□	□	□	□
36. Αναλαμβάνω διαφορετικά καθήκοντα στην εργασία μου.	□	□	□	□	□

“Απαιτήσεις Εργασίας”

	Πάντα	Συχνά	Μερικές φορές	Σπάνια	Ποτέ
37. Εργάζομαι κάτω απο έντονη πίεση.	□	□	□	□	□
38. Το βρίσκω δύσκολο να τελειώσω τα καθήκοντα μου στην ώρα τους.	□	□	□	□	□
39. Χρειάζομαι επιπλέον χρόνο να τελειώσω τα καθήκοντα της εργασίας μου.	□	□	□	□	□
40. Δεν έχω αρκετό χρόνο για να τελειώσω τα καθήκοντα της εργασίας μου.	□	□	□	□	□
41. Στη δουλειά αυξάνω τους ρυθμούς μου για να τελειώσω τα καθήκοντά μου έγκαιρα.	□	□	□	□	□
42. Βρίσκω τα καθήκοντα της εργασίας μου δύσκολα.	□	□	□	□	□
43. Έχω πάρα πολλά καθήκοντα στην εργασία μου.	□	□	□	□	□

“Διάλειμμα”

	Πάντα	Συχνά	Μερικές φορές	Σπάνια	Ποτέ
44. Μπορώ να προγραμματίσω τα διαλείμματα στην εργασία μου.	□	□	□	□	□
45. Μπορώ να μοιράσω τον χρόνο της εργασίας μου.	□	□	□	□	□
46. Μπορώ να αποφασίσω πότε να κάνω διάλειμμα.	□	□	□	□	□
47. Αλλάζω τη στάση του σώματός μου.	□	□	□	□	□
48. Τα καθήκοντα της εργασίας μου αλλάζουν, όποτε χρειάζεται.	□	□	□	□	□
49. Εκτελώ τα καθήκοντα της εργασίας μου χωρίς υπολογιστή.	□	□	□	□	□
50. Μετά απο δυο ώρες, κάνω διάλειμμα για δέκα λεπτά.	□	□	□	□	□
51. Βρίσκω τα διαλείμματα στη δουλειά ικανοποιητικά.	□	□	□	□	□

“Περιβάλλον Εργασίας”

	Πάντα	Συχνά	Μερικές φορές	Σπάνια	Ποτέ
52. Βρίσκω το περιβάλλον της εργασίας μου καλό.	□	□	□	□	□
53. Ο αέρας στο εσωτερικό του γραφείου είναι πολύ ξηρός.	□	□	□	□	□
54. Ο αέρας στο εσωτερικό του γραφείου είναι πολύ κρύος.	□	□	□	□	□
55. Στο γραφείο υπάρχει ακατάλληλος αερισμός.	□	□	□	□	□
56. Στην εργασία μου υπάρχει κατάλληλος αερισμός.	□	□	□	□	□
57. Το περιβάλλον εργασίας μου είναι πολύ θορυβώδες.	□	□	□	□	□
58. Ο χώρος εργασίας μου είναι πολύ φωτεινός.	□	□	□	□	□
59. Κοιτάζω για πολλές ώρες συνεχόμενα την οθόνη του υπολογιστή.	□	□	□	□	□
60. Στην οθόνη του υπολογιστή αντανακλούν τα φώτα του γραφείου ή του παραθύρου.	□	□	□	□	□

“Κοινωνική Υποστήριξη”

	Πάντα	Συχνά	Μερικές φορές	Σπάνια	Ποτέ
61. Η ροή της δουλειάς είναι ομαλή.	□	□	□	□	□
62. Μπορώ να ρωτήσω και να ζητήσω πληροφορίες στη δουλειά μου.	□	□	□	□	□
63. Τα καθήκοντα της εργασίας μου εξαρτώνται από τους άλλους συναδέλφους μου.	□	□	□	□	□
64. Το εργασιακό περιβάλλον είναι άνετο.	□	□	□	□	□
65. Εάν κανώ λάθος στα καθήκοντα της εργασίας μου	□	□	□	□	□

βρίσκω υποστήριξη από τους συναδέλφους μου.					
66. Εάν κάνω λάθος στα καθήκοντα της εργασίας μου βρίσκω υποστήριξη από τον ανώτερό μου (προϊστάμενο).	□	□	□	□	□
67. Οι συνάδελφοι μου είναι φιλικοί.	□	□	□	□	□
68. Οι ανώτεροι μου (προϊστάμενοι) είναι φιλικοί.	□	□	□	□	□

Ενοχλήσεις: Κατά τη διάρκεια του τελευταίου έτους είχα πόνο ή παραπονέθηκα για τουλάχιστον μία εβδομάδα για μια ή περισσότερες περιοχές του σώματος.

69. Αυχένας
□ Όχι
□ Ναι

70. Ώμος
□ Όχι
□ Ναί → Εάν ναι, □ Αριστερός □ Δεξιός □ Και οι δυο

71. Βραχίονας
□ Όχι
□ Ναι → Εάν ναι, □ Αριστερός □ Δεξιός □ Και οι δυο

72. Αγκώνας
□ Όχι
□ Ναι → Εάν ναι, □ Αριστερός □ Δεξιός □ Και οι δυο

73. Αντιβράχιο
□ Όχι
□ Ναι → Εάν ναι, □ Αριστερό □ Δεξιό □ Και τα δυο

74. Καρπός
□ Όχι
□ Ναι → Εάν ναι, □ Αριστερός □ Δεξιός □ Και οι δυο

75. Παλάμη και δάχτυλα
□ Όχι
□ Ναι → Εάν ναι,
□ Αριστερή
□ Δεξιά
□ Και οι δυο

76. Κατά τη διάρκεια του τελευταίου έτους είχα πόνο/ενόχληση/ανικανότητα στο άνω άκρο.
□ Όχι
□ Ναι

77. Η μεγαλύτερη περίοδος ενοχλήσεων κατά την οποία δεν μπορούσα να εκτελέσω την καθημερινή μου δραστηριότητα ήταν
□ ____Μέρες
□ ____Εβδομάδες

78. Κατά την διάρκεια του τελευταίου έτους προσέφυγα σε ειδικό λόγω του πόνου στο άνω άκρο;
□ Όχι
□ Ναι→ Η διάγνωση των ενοχλήσεων ήταν;
_____

79. Τι είδους θεραπεία δεχτήκατε (κατά τον τελευταίο χρόνο);
□ Καμία
□ Φυσικοθεραπεία
□ Φάρμακα
□ Εγχείρηση
□ Άλλο _____

80. Λόγω του πόνου στο άνω άκρο έχω χάσει την εργασία μου στο παρελθόν.
□ Όχι
□ Ναι

81. Λόγω των ενοχλήσεων στο άνω άκρο (κατά τη διάρκεια του περασμένου έτους) απουσίαζα από την εργασία μου.
□ Όχι
□ Ναι

82. Λόγω των ενοχλήσεων στο άνω άκρο το περασμένο έτος οι δραστηριότητες μου εμποδίστηκαν

- στην εργασία μου □ Όχι
□ Ναι

- στον ελεύθερο χρόνο μου □ Όχι
□ Ναι

83. Οι ενοχλήσεις μου οφείλονται σε προηγούμενο ατύχημα. □ Όχι
□ Ναι

Οι επόμενες ερωτήσεις αναφέρονται σε παράπονα λόγω πόνου στον αυχένα, τον ώμο, το χέρι, τον καρπό και τον αγκώνα κατά το προηγούμενο έτος.

84.	Νιώθω πόνο στο άνω άκρο μόλις τελειώνω την εργασία μου.	□ Όχι □ Ναι →	Αυτός ο πόνος εξαφανίζεται μετά από λίγη ξεκούραση	□ Όχι □ Ναι
85.	Νιώθω κούραση και εξάντληση στο άνω άκρο.	□ Όχι □ Ναι →	Αυτή η ενόχληση εξαφανίζεται μετά από λίγη ξεκούραση	□ Όχι □ Ναι
86.	Νιώθω δυσκαμψία στα δαχτυλά μου.	□ Όχι □ Ναι →	Αυτή η δυσκαμψία εξαφανίζεται μετά από λίγη ξεκούραση	□ Όχι □ Ναι
87.	Νιώθω μούδιασμα στα δάχτυλά μου.	□ Όχι		

□ Ναι → Αυτό το μούδιασμα συνεχίζει μετά από λίγη ξεκούραση □ Όχι □ Ναι

88. Νιώθω μυρμήγκιασμα στα δάχτυλά μου.
□ Όχι
□ Ναι → Αυτό το μυρμήγκιασμα συνεχίζει και μετά τη δουλειά □ Όχι □ Ναι

89. Νιώθω αδυναμία στο άνω άκρο.
□ Όχι
□ Ναι → Αυτή η αδυναμία συνεχίζει και μετά τη δουλειά □ Όχι □ Ναι

90. Υποφέρω από πρήξιμο στα χέρια.
□ Όχι
□ Ναι → Αυτό το πρήξιμο συνεχίζει και μετά τη δουλειά □ Όχι □ Ναι

91. Νιώθω πρήξιμο/δυσκαμψία στο άνω άκρο
□ Όχι
□ Ναι

92. Νιώθω συνεχόμενο πόνο στο άνω άκρο
□ Όχι
□ Ναι

93. Νιώθω μια αλλαγή στο χρώμα, τη θερμοκρασία ή την εφίδρωση του άνω άκρου
□ Όχι
□ Ναι

94. Χρησιμοποιώ mousepad (υποστήριξη ποντικιού), θήκες
□ Όχι

	αρχειοθέτησης και υποπόδιο για να μειώσω τον πόνο στο άνω άκρο	□ Ναι
95.	Χρησιμοποιώ κολλάρο αυχένα ή ζώνες (νάρθηκες) ή άλλα εξαρτήματα για να μειώσω τον πόνο στο άνω άκρο.	□ Όχι □ Ναι

Appendix 2

Maastricht Upper Extremity Questionnaire (MUEQ)

General Information:

1.	Gender	□ Male □ Female
2.	Surname	_____
3.	Date of birth?	___-___-19___
4.	Where do you work?	□ Heerlen □ Maastricht □ Both
5.	What is your current position?	_____
6.	How long have you been working in this position?	___ Year
7.	How many days do you work per week? (*over time not included*)	___ Day
8.	How many hours do you work per day? *(breaks and over time not included)*	___ Hour
9.	How many hours per working day do you work behind your computer?	___ Hour

Work Station

10.	My desk (table) at work has suitable height.	□ No □ Yes

11. I can adjust my chair height.	□ No □ Yes
12. When I use the mouse device, my arm is supported by the table.	□ No □ Yes
13. The chair I use during work supports my lower back.	□ No □ Yes
14. My keyboard is placed directly in front of me.	□ No □ Yes
15. The screen is placed directly in front of me.	□ No □ Yes
16. I have enough space to work at my office.	□ No □ Yes

Body Posture

	Always	Often	Sometimes	Seldom	Never
17. During my work I keep a good work posture.	□	□	□	□	□
18. At work I sit for long hours in one position.	□	□	□	□	□
19. For more than two hours per day I sit with lifted shoulders.	□	□	□	□	□
20. During my work I sit in awkward posture.	□	□	□	□	□
21. In work I perform repetitive tasks.	□	□	□	□	□
22. I find my job physically exhausting.	□	□	□	□	□
23. When I key my hand is placed in a straight line with my lower arm.	□	□	□	□	□
24. When I work my head is bended.	□	□	□	□	□
25. Head is twisted towards the left or right.	□	□	□	□	□
26. Trunk is twisted towards the left or right.	□	□	□	□	□
27. My Trunk is in asymmetrical position.	□	□	□	□	□

Job Control

	Always	Often	Sometimes	Seldom	Never
28. I decide how to perform my job task.	□	□	□	□	□
29. I participate with others in decision taking.	□	□	□	□	□
30. I decide my own task changes.	□	□	□	□	□
31. I determine the time & speed job tasks.	□	□	□	□	□
32. I solve work problems by my self.	□	□	□	□	□
33. My work develops my abilities.	□	□	□	□	□
34. In my work I learn new things.	□	□	□	□	□
35. I have to be creative in my work.	□	□	□	□	□
36. I under take different tasks in my work.	□	□	□	□	□

Job Demand

	Always	Often	Sometimes	Seldom	Never
37. I work under extensive work pressure.	□	□	□	□	□
38. I find it difficult to finish my tasks on time.	□	□	□	□	□
39. I take extra hours to finish my job tasks.	□	□	□	□	□
40. I have no enough time to finish my job task.	□	□	□	□	□
41. At work I speed to finish my tasks on time.	□	□	□	□	□
42. I find my work tasks difficult.	□	□	□	□	□
43. I have too many job tasks.	□	□	□	□	□

Break Time

	Always	Often	Sometimes	Seldom	Never
44. I can plan my work breaks.	□	□	□	□	□
45. I can divide my work time.	□	□	□	□	□

46. I can decide when to take a break.	□	□	□	□	□
47. I alternate in my body posture.	□	□	□	□	□
48. I alternate in my job task.	□	□	□	□	□
49. I perform job task without computer.	□	□	□	□	□
50. After two hours I take a break for 10 minutes.	□	□	□	□	□
51. I find my work breaks sufficient.	□	□	□	□	□

Work environment

	Always	Often	Sometimes	Seldom	Never
52. I find my work environment good.	□	□	□	□	□
53. The air inside the office is too dry.	□	□	□	□	□
54. The air inside the office is too cold.	□	□	□	□	□
55. In the office there is unwanted air.	□	□	□	□	□
56. There is available fresh air in my work.	□	□	□	□	□
57. My work environment is noisy.	□	□	□	□	□
58. My work place is too bright.	□	□	□	□	□
59. I gaze at the computer screen.	□	□	□	□	□
60. The computer screen reflects the office lights.	□	□	□	□	□

Social Support

	Always	Often	Sometimes	Seldom	Never
61. The work flow goes smoothly.	□	□	□	□	□
62. I can ask and enquire in my work.	□	□	□	□	□
63. My work tasks depend on other colleges.	□	□	□	□	□
64. My work atmosphere is comfortable.	□	□	□	□	□
65. If I made a mistake in my work task I find support from my colleges.	□	□	□	□	□

66. If I made a mistake in my work task I find support from my supervisors.	□	□	□	□	□
67. My colleagues are friendly.	□	□	□	□	□
68. My supervisors are friendly.	□	□	□	□	□

Complaints

During the past year I had pain or complaints for at least one week in one or more of the following body regions

69. Neck	□ No		
	□ Yes		
70. Shoulder(s)	□ No		□ Left
	□ Yes →	If Yes,	□ Right
			□ Both
71. Upper Arm	□ No		□ Left
	□ Yes →	If Yes,	□ Right
			□ Both
72. Elbow (s)	□ No		□ Left
	□ Yes →	If Yes,	□ Right
			□ Both
73. Lower Arm	□ No		□ Left
	□ Yes →	If Yes,	□ Right
			□ Both
74. Wrists	□ No		□ Left
	□ Yes →	If Yes,	□ Right
			□ Both
75. Hand	□ No		□ Left
	□ Yes →	If Yes,	□ Right
			□ Both

From here (upper musculoskeletal extremity) would be used to represent (neck, shoulder, hand, wrist, arm and elbow)

76. During the past year I had pain/complaint/disability in my upper musculoskeletal extremity	□ No □ Yes
77. The longest period of complaint (in the past year) whereby I could not perform my daily activity was	□ ____Days □ ____weeks
78. During the past year I was referred to the physician due to my upper extremity pain?	□ No □ Yes→ The physician. Diagnosis of the complaint was? _____
79. What kind of treatment did you receive (during the past year)	□ Physiotherapy □ Medication □ Operation □ Other _____
80. Because of my upper extremity pain I have lost a job before	□ No □ Yes
81. Because of my upper extremity complaints (during the past year) I was absent from work	□ No □ Yes
82. Due to upper extremity complaints in the past year my activities were hindered	□ No □ Yes
- in my work	□ No
- in my leisure time	□ Yes
83. My complaints are due to a previous accident.	□ No □ Yes

The next questions are related to pain complaints in the neck, shoulder, hand, wrist, and elbow in the past year

84. I feel pain in my upper musculoskeletal extremity as soon as I finish work	□ No □ Yes →	This pain disappears after a short rest	□ No □ Yes

85. I feel fatigue and exhaustion in my upper musculoskeletal extremity	□ No □ Yes →	This complaint disappears after a short rest	□ No □ Yes
86. I feel stiffness in my finger	□ No □ Yes →	This stiffness disappears after a short rest	□ No □ Yes
87. I feel numbness in my fingers	□ No □ Yes →	This numbness continues after a short rest	□ No □ Yes
88. I feel tingling in my fingers	□ No □ Yes →	This tingling continue after work	□ No □ Yes
89. I feel weakness in my upper musculoskeletal extremity	□ No □ Yes →	This weakness continue after work	□ No □ Yes
90. I suffer from swelling in my hands	□ No □ Yes →	This swelling continue after work	□ No □ Yes
91. I feel swelling/ stiffness in my upper musculoskeletal extremity	□ No □ Yes		
92. I feel continuous pain in my upper musculoskeletal extremity	□ No □ Yes		
93. I feel a change in the colour, temperature, sweating in my upper musculoskeletal extremity	□ No □ Yes		
94. I use mouse pad, file holder, foot supporter to reduce upper musculoskeletal extremity pain	□ No □ Yes		
95. I use neck collar or belts or other to reduce upper musculoskeletal extremity pain	□ No □ Yes		