

**Μυοσκελετικές διαταραχές σε εργαζόμενους γραφείου και τηλεεργαζόμενους κατά τη διάρκεια της πανδημίας SARS Cov2**Κοτζαμπουγιούκ Ελένη¹, Γουρζουλίδης Γεώργιος², Ξυδέα – Κικεμένη Αναστασία³

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ΠΕΡΙΛΗΨΗ

Εισαγωγή: Η πανδημία του κοροναϊού επέφερε μεγάλες αλλαγές στην καθημερινή εργασιακή ζωή στην Ελλάδα. Η πλειονότητα των τηλεεργαζόμενων αντιμετώπισε συνέπειες στην υγεία, όπως επιπτώσεις στο μυοσκελετικό τους σύστημα.

Σκοπός: Η παρούσα μελέτη είχε ως στόχο να ερμηνεύσει μέσω των ερευνητικών ερωτημάτων τη μυοσκελετική υγεία των εργαζομένων και να διερευνήσει τη σχέση μεταξύ τηλεεργασίας και μυοσκελετικών διαταραχών.

Υλικό και Μέθοδος: Η συγχρονική μελέτη διεξήχθη σε δείγμα 232 εργαζομένων σε υπουργείο μέσω ενός εσωτερικού κατασκευασμένου ερωτηματολογίου δημογραφικών και εργασιακών χαρακτηριστικών και του γενικού σκανδιναβικού ερωτηματολογίου για τα μυοσκελετικά συμπτώματα (NMQ). Μετά τις απαραίτητες εγκρίσεις, τα ερωτηματολόγια διανεμήθηκαν και συλλέχθηκαν τον Νοέμβριο και τον Δεκέμβριο του 2021 και υποβλήθηκαν σε περαιτέρω στατιστική επεξεργασία με το SPSS19.

Αποτελέσματα: Το δείγμα της μελέτης ήταν κυρίως γυναίκες (72,4%), με μέση ηλικία 48,1±10,3 έτη. Ο συνολικός μέσος όρος των ετών υπηρεσίας ήταν 23,5±8,7. Ο μέσος όρος των εβδομαδιαίων ωρών εργασίας ήταν 41,6±4,7. Το 94,4% ανέφερε ότι αντιμετώπιζε ενοχλήσεις από τουλάχιστον ένα μυοσκελετικό πρόβλημα τους τελευταίους 12 μήνες, ενώ το 59,1% είχε πρόβλημα στην καθημερινή του εργασία λόγω ενοχλήσεων σε τουλάχιστον ένα μέρος του σώματος. Οι πιο σημαντικές θετικές συσχετίσεις βρέθηκαν για τις μυοσκελετικές διαταραχές: τους τελευταίους 12 μήνες σε σχέση με το φύλο στην περιοχή του αυχένα και της ωμοπλάτης, σε δυσφορία κατά τη διάρκεια των καθημερινών δραστηριοτήτων τους τελευταίους 12 μήνες σε σχέση με το φύλο και το άνω μέρος της πλάτης και μεταξύ των εβδομαδιαίων ωρών εργασίας και της δυσφορίας στους ώμους, τους αγκώνες και τους καρπούς.

Συμπεράσματα: Η βίαιη αύξηση της τηλεεργασίας φαίνεται να έχει προκαλέσει αύξηση των μυοσκελετικών διαταραχών στον αυχένα, στην περιοχή των ώμων και στα άνω άκρα.

Λέξεις Κλειδιά: Μυοσκελετικά προβλήματα, τηλεεργασία από το σπίτι, εργασία γραφείου μέσω υπολογιστή, Γενικό Σκανδιναβικό Ερωτηματολόγιο για τα μυοσκελετικά συμπτώματα (NMQ).

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ORIGINAL ARTICLE

Musculoskeletal disorders in office workers and teleworkers during the SARS pandemic Cov2Kotzampougiouk Eleni¹, Gourzoulidis George², Xydea – Kikemeni Anastasia³

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ABSTRACT

Introduction: The coronavirus pandemic brought great changes in daily working life in Greece. The majority of telecommuting workers faced consequences on health such as effects on their musculoskeletal system.

Aim: This study aimed to interpret through the research questions the workers' musculoskeletal health and investigate the relationship between telecommuting and musculoskeletal disorders.

Material and Method: The cross-sectional study was conducted on a sample of 232 ministry employees through an in-house built questionnaire of demographic and work characteristics and the General Nordic for the musculoskeletal symptoms Questionnaire (NMQ). After the necessary approvals, the questionnaires were distributed and collected in November and December 2021 and were further statistically processed with SPSS19.

Results: The study sample was mainly female (72.4%), with a mean age of 48.1 ± 10.3 years. The overall average years of service were 23.5 ± 8.7 ; the average weekly working hours were 41.6 ± 4.7 . 94.4% reported experiencing discomfort from at least one musculoskeletal problem in the last 12 months, while 59.1% had a problem at their day job due to discomfort in at least one part of the body. The most significant positive correlations were found for musculoskeletal disorders: in the last 12 months in relation to gender in the neck and scapular region, in discomfort during daily activities in the last 12 months in relation to gender and upper back and between weekly working hours and discomfort in shoulders, elbows and wrists.

Conclusions: The violent increase in telecommuting seems to have caused an increase in musculoskeletal disorders in the neck, shoulder region and upper limbs.

Keywords: Musculoskeletal problems, teleworking from home, computer-based office work, General Nordic for the Musculoskeletal Symptoms Questionnaire (NMQ).

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INTRODUCTION

The 2020-21 biennium brought significant changes in people's lifestyles and work patterns due to the SARS-CoV-2 pandemic. From March 2020, Greece, like many European countries, took measures regarding the restriction of free movement of people, the restriction of commercial activities, the complete cessation of face-to-face education at all levels, the cessation of recreational, cultural and sports activities. Therefore, after two quarantine periods the sudden increase in work from home, amounted to 50% of public and private sector workers.

This vast amount of workers in Greece was forced to rapidly adapt to the new working conditions, as the country had limited experience not only on teleworking using

Information and Communication Technology (ICT), but also on the consequences of teleworking such as the impact on workers' health.¹

The advantages and disadvantages of teleworking, a largely voluntary form of work agreed between employer and employee in general, are known from studies in other countries. However, it appears from the results that the new situation created during the pandemic had additional physical and psychological effects.²

Musculoskeletal disorders, one of the most common modern health problems associated with office work, affect many workers.³ Recent evidence and bibliographical references have highlighted that workplace conditions can affect the musculoskeletal

health of workers. In this sense, changing the workplace location may cause changes in the working conditions, like the posture, the available ergonomic equipment and the performance of the worker.^{4,5} The resulting risks (e.g. long hours of sedentary work under poor posture) are associated with a higher prevalence of painful musculoskeletal disorders (particularly in the lumbar, neck and upper limbs).^{4, 6-10}

The onset or worsening of musculoskeletal pain, resulting from the interaction of physical, physiological, emotional, cognitive, behavioral and socio-cultural factors, has an impact at the individual, business and insurance level, with the impairment/damage of normal functions, temporary or permanent disability and an increase in the average annual cost of a country's total health care expenditure.^{11,12} At the same time, the association between anxiety, stress and inadequate coping with pain seems to be strengthened.¹³⁻¹⁵

The lack of similar studies in Greece led to the present study, in order to highlight and evaluate the musculoskeletal burden during teleworking and the resulting increase in musculoskeletal disorders (acute, often and chronic musculoskeletal problems that impede daily life and work). Ergonomic factors were also evaluated. The musculoskeletal disorders of ministry employees engaged in office work during the

period of teleworking due to Covid-19, were investigated and compared with previous data of their musculoskeletal health.

MATERIAL AND METHODS

The sample consisted of employees of a Greek Ministry, who agreed to participate in a cross-sectional study related to the recording of their musculoskeletal disorders.

The data was collected through a self-completed questionnaire with two parts, one consisting of the demographic and occupational data of the participants and the other consisting of the general Nordic for the musculoskeletal symptoms Questionnaire (NMQ) weighted in the Greek language. The body regions under concern are indicated in the body shape of Figure 1.

After the department's permission and approval by the Research Ethics Committee of the University of West Attica, the questionnaire was distributed anonymously to 280 public officers of different departments regardless of their employment relationship. The response rate was 82.8%, making 232 employees the final sample of the survey.

The distribution and collection of the questionnaires took place between November and December 2021. The questionnaires were then coded and statistically processed using the SPSS19 statistical package, where in addition to the description, Pearson's correlation analysis, x²-test and t-test for

independent samples were applied. The significance level was set at 5%.

RESULTS

The demographic, employment and other general data are presented in Table 1. The distribution of participants was female (72.4%) and male (27.6%), married (61.6%), mean age 48.1 ± 10.3 years and an average of 1.2 ± 1.0 children. The overwhelming majority of the sample consisted of higher education graduates (91.8%) of which 57.3% reported holding both a master's/doctoral degree with 28.9% holding a position of responsibility.

The employees reported an average total time of 23.5 ± 8.7 years of experience and an average of 20.9 ± 9.3 years of experience in an office position. The average weekly working time is 41.6 ± 4.7 hours. The average duration of telecommuting during the study period was 10.3 ± 5.2 months.

Regarding the effects of telecommuting, 21.5% of the respondents suffered a change in their working hours, 58.6% suffered a change in social relations with colleagues, 53.9% reported disturbances in the work process and 51.3% reported annoyance from various factors during work.

Regarding musculoskeletal disorders (Figure 1), 38.4% reported having some musculoskeletal discomfort before the telecommuting period, which increased to 94.4% (Table 2) after the start of

telecommuting. The majority of those who responded to the above question considered this increase to be due to work, as few had ergonomic equipment (38.0% had an ergonomic seat, 30.2% a footrest and 30.2% an adjustable monitor and keyboard).

The results of the Nordic questionnaire are presented in Table 2, where 94.4% of employees state that in the last 12 months (teleworking period) they have experienced musculoskeletal discomfort in at least one part of their body, with the highest percentages concentrated in the shoulders (50.9%), lower back (41.4%) and wrists/hands (40.1%).

This discomfort from at least one musculoskeletal problem appears to affect 59.1% of workers' daily activities and work performance, with higher rates in the neck (34.1%), lower back (27.2%), shoulders (26.3%) and wrists/hands (24.1%). At a lower rate, 41.8% reported having musculoskeletal discomfort in at least one part of their body in the last 7 days, with the highest rates concentrated in the neck (36.6%), shoulders (31.5%) and lower back (25.4%).

Table 3 shows the positive correlations (p-values less than the 5% significance level) with respect to gender (women) and various regions discomfort (e.g. neck, scapular), working time (age, total length of service and weekly working hours) and various regions.

A negative correlation was demonstrated between age and neck discomfort ($p=0.014$).

When applying the χ^2 control between the variables for musculoskeletal problems in the last 12 months and whether there was a musculoskeletal problem before teleworking, the research hypothesis that an increased percentage of employees developed musculoskeletal problems during teleworking without previously having similar discomfort was confirmed ($p\text{-value} = 0.003$).

Finally, the correlations confirmed by the Nordic questionnaire responses regarding the body parts are pointed out in Table 4.

DISCUSSION

The survey indicates that there was a worsening of physical problems during teleworking.

It seems that women are most affected and that age and working hours have an impact on physical problems.

More specifically, key findings of the analysis of the results were the following:

Firstly, women seemed to be more affected by the frequency of telecommuting. This is evident from the statistically significant positive correlations between:

gender and neck discomfort in the last 12 months ($r=0.185$ as $p\text{-value}=0.005<0.05$),

gender and discomfort in the scapular region in the last 12 months ($r=0.241$ as $p\text{-value}=0.000<0.05$),

gender and pain experience in daily activity in the upper back region ($r=0.183$ as $p\text{-value}=0.005<0.05$),

gender and hip pain ($p=0.020$) and

knee pain and gender ($p=0.05$).

The resulting high prevalence in relation to gender is a finding that is consistent with other studies showing that women working with computers seem to suffer more from musculoskeletal pain.^{4,16} These results confirm gender differences in the development of musculoskeletal pain.^{17, 18}

The results on age appear to be statistically significantly associated with a negative correlation:

age and neck discomfort in the last 12 months ($r=0.161$ as $p\text{-value}=0.014<0.05$) as the age increases, the neck discomfort decreases, a result that agrees with other studies that have shown that neck pain decreases in older people.¹⁹ The interpretation of this result may be due to the greater involvement of younger people with electronic media and in their leisure time, therefore more strain in general.

The positive correlation found between hip pain and age ($r=0.151$ as $p\text{-value}=0.021<0.05$), i.e. the older the age, the more the hip pain increases, can be explained by the overuse of the joints, sedentary behavior and lack of physical exercise. This result contradicts results that have been reported showing that hip and joint pain

decreases with increasing age.^{20,21} The same is also true between the total length of service and hip discomfort in the last 12 months ($r=0.161$ as $p\text{-value}=0.014<0.05$), meaning that as the total length of service increases, hip discomfort increases. This effect is not necessarily due to teleworking, although ergonomic or non-ergonomic equipment plays an important role.

Positive correlations were found between weekly working hours and pain location in the scapular areas ($r=0.204$ and $p\text{-value}=0.002<0.05$), pain location in the lower back ($p=0.048$), pain location in elbows ($r=0.219$ as $p\text{-value}=0.001<0.05$), pain location in wrists/hands ($p=0.049$), knee discomfort ($p=0.021$) and pain location in ankles/feet ($r=0.215$ as $p\text{-value}=0.001<0.05$). All p -values are less than the 5% significance level, thus statistically significant. This means that as the weekly working hours increase, the localization of pain in the aforementioned sites increases, which is consistent with other similar published studies in.²²

A basic question of the present study was whether the employees experienced the same degree of musculoskeletal problems before and after the change of work regime to telecommuting. 38.4% of the respondents reported that they suffered from a musculoskeletal problem before telecommuting, while 56% appear to have developed a musculoskeletal problem during

it. On the occasion of this increase in musculoskeletal problems by 26.7% of workers, the ergonomic and organizational conditions of telework should be investigated. This is an issue that is 'traditionally' assessed through Occupational Health and Safety (OHS) principles. In this sense, the presented results might be more indicative for Occupational Physicians.

Limitations of the present study have to do with self-reported pain although the questionnaire used has a high degree of sensitivity and specificity, as the NMQ is the state of the art worldwide for many decades. Future work may include some kind of measurement using dedicated sensors and/or wearables, in order to verify findings.

CONCLUSIONS

The present study is a first approach in Greece to correlate directly the conditions of teleworking and the occurrence or increase of musculoskeletal disorders. The sample was public officers who, due to the pandemic, have been forced to work from home.

Women appear to have significantly more discomfort than their men colleagues in the neck, scapular region, lumbar region and large joints of the lower limbs.

Musculoskeletal disorders appear to be linked to age, sedentary behavior and lack of proper ergonomic equipment.

The working population that teleworked during the pandemic increased in all countries, while helping to highlight the most important occupational safety and health issues (including musculoskeletal disorders). A fact that obliges the EU to review the framework agreement of 2002 and individual directives and guidelines in order to initiate legislative changes related to the statutory definition of telework, the right to disconnect, the right to telework and OSH provisions.

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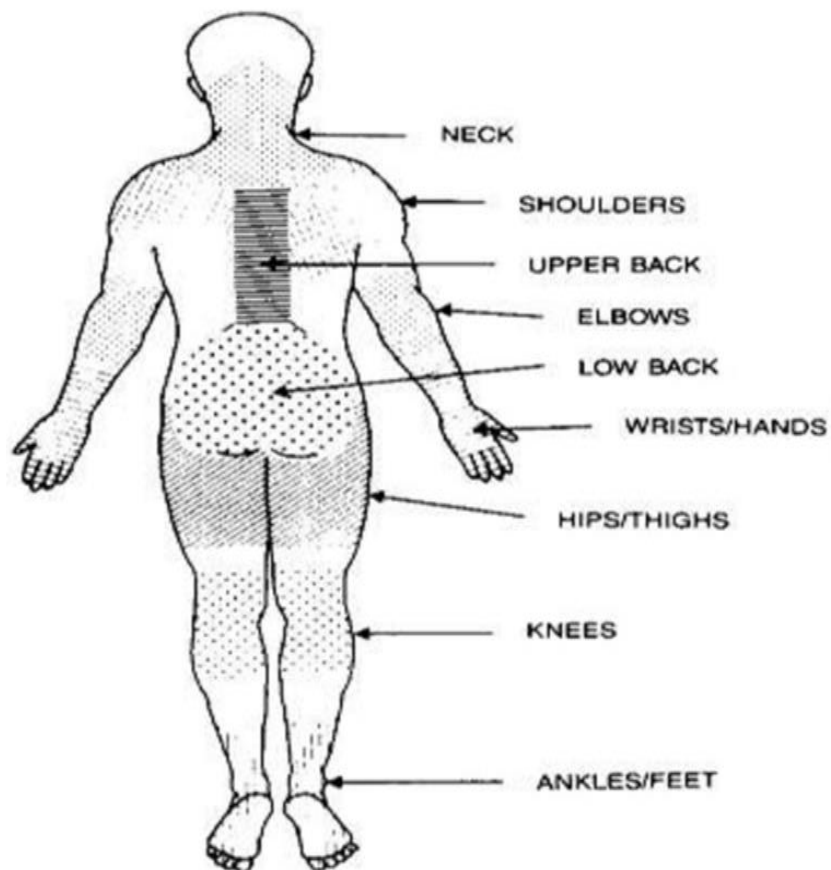


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ANNEX

FIGURE 1. Figure from the standardized Nordic questionnaire for musculoskeletal symptoms.



Body sites; standardized Nordic questionnaire for musculoskeletal symptoms

TABLE 1. Demographic & labour characteristics of the sample.

Parameter	N	%
Total	232	100
Man/Male	64	27,6
Woman/ Female	168	72,4
Married	143	61,6
Unmarried	55	23,7
Other	34	14,7
Higher education	213	91,8
Primary & Secondary education	19	8,2
Head of	67	28,9
Employee	165	71,1
Average age (years)	48,1±10,3	
Body mass index	25,6±17,0	
Average number of children	1,22±1,0	
Average total experience (years)	23,5±8,7	
Average previous experience in an office position	20,9±9,3	
Average weekly working hours (hours)	41,6±4,7	
Average duration of teleworking (months)	10,3±5,2	
Change of working hours due to teleworking		
Yes	50	21,5
No	182	78,5
Free daily time		
< from 2 hours	98	42,3
2< hours<4	78	33,6
> than 4 hours	56	24,1
Change in free time due to teleworking		
Yes	105	45,3
No	127	54,7
Disturbance during teleworking		
Yes	119	51,3
No	113	48,7
Changing social relationships with colleagues due to teleworking		
Yes	136	58,6
No	96	41,4
Disturbances in the working process due to teleworking		
Yes	125	53,9
No	107	46,1

Musculoskeletal problem before the teleworking scheme			
	Yes	89	38,4
	No	143	61,6
Musculoskeletal problem due to teleworking			
	Yes	119	51,3
	No	113	48,7
They have an ergonomic seat		88	38,0
They have an adjustable display		70	30,2
They have an adjustable keyboard		70	30,2

TABLE 2. Distribution of musculoskeletal disorders in the sample and point of detection in the last 12 months, in daily activities and in the last week.

Disturbance in		in the last 12 months	in the daily work	last week
		N (%)	N (%)	N (%)
in at least one spot	No	13 (5,6%)	95 (40,9%)	135 (58,2%)
	Yes	219 (94,4%)	137 (59,1%)	97 (41,8%)
in the neck	No	146 (62,9%)	153 (65,9%)	147 (63,4%)
	Yes	86 (37,1%)	79 (34,1%)	85 (36,5%)
in the shoulders	No	114 (49,1%)	171 (73,7%)	159 (68,5%)
	Yes	118 (50,9%)	61 (26,3%)	73 (31,5 %)
in the elbows	No	197 (84,9%)	208 (89,7%)	212 (91,4%)
	Yes	35 (15,1%)	24 (10,3%)	20 (8,6%)
in the wrists/hands	No	139 (59,9%)	176 (75,9%)	189 (81,5%)
	Yes	93 (40,1%)	56 (24,1%)	43 (18,5%)
in the upper part of the back	No	174 (75%)	207 (89,2%)	205 88,4%)
	Yes	58 (25%)	25 (10,8%)	27 (11,6%)
in the lower back	No	136 (58,6%)	169 (72,8%)	173 (74,6%)
	Yes	96 (41,4%)	63 (27,2%)	59 (25,4%)
in the hip/hips	No	172 (74,1%)	199 (85,8%)	202 (87,1%)
	Yes	60 (25,9%)	33 (14,2%)	30 (12,9%)
in the knee/knees	No	147 (63,4%)	195 (84,1%)	196 (84,5%)
	Yes	85 (36,6%)	37 (15,9%)	36 (15,5%)
in the ankles/legs	No	207 (89,2%)	215 (92,7%)	216 (93,1%)
	Yes	25 (10,8%)	17 (7,3%)	16 (6,9%)

TABLE 3. Positive/Negative associations.

Variable		Discomfort in the last 12 months		Daily discomfort
<u>Gender (women)</u>	Neck	Pearson Correlation	,185**	
		p-value	,005	
	Shoulder areas/shoulders	Pearson Correlation	,241**	
		p-value	,000	
	Upper part of the back	Pearson Correlation		,183**
		p-value		,005
Age	Neck	Pearson Correlation	-,161*	
		p-value	,014	
	Hip/hips	Pearson Correlation	,151*	
		p-value	,021	
Total work experience	Hip/hips	Pearson Correlation	,161*	
		p-value	,014	
Weekly working hours	Shoulder areas/shoulders	Pearson Correlation		,204**
		p-value		,002
	Elbows	Pearson Correlation		,219**
		p-value		,001
	Wrists/hands	Pearson Correlation		,153*
		p-value		,020
	Ankles/legs	Pearson Correlation	,180**	,215**
		p-value	,006	,001

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

TABLE 4. Positive correlations of NMQ questionnaire variables.

	Sex (women)	Working hours (weekly)
	p-value	p-value
Disturbance in the last 12 months in:		
Neck	0,005	
Shoulder	0,043	
Knee	0,05	0,021
Disturbance in the last 12 months in daily activity in:		
Hip	0,020	
Wrist/hands	-	0,049
Lower part of the back		0,048