The Musculoskeletal System Complaints of Office Workers at a Vehicle Production Factory

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Abstract

This study aimed to determine the prevalence of and factors contributing to musculoskeletal system complaints (MSC) in office workers of a vehicle production factory and absenteeism due to these complaints. A total of 86.2% ($n = 333$) of the workers completed the survey. Of the workers, 73 (21.9%) were women, and 260 (78.1%) were men, and the mean age was 36.9 $\pm$ 8.75 years. The majority of the personnel had more than one symptom with a prevalence of 80.8%. The most frequently observed discomfort was tension and pain in the back muscles (58.6%) and in the neck muscles (58.3%), followed by low back pain (41%) and shoulder pain (30.3%). Pain in the shoulders, neck, and the back and pain and numbness in the fingers were statistically significantly more prevalent in employees who spent more than 5 hours per day performing desk work. Furthermore, all of the complaints, excluding pain in the elbows and knees, were statistically significantly more common in the women. When each complaint and the effects of contributing risk factors were analyzed by logistic regression analysis, pain in the shoulders, neck, and back; pain that spread to the arms; and pain in the fingers were correlated with longer work hours and the female gender ($p < 0.05$). The number of employees who had used sick leave within the past year due to MSCs was 11.7%. In conclusion, duration of work hours, frequency of breaks, and gender were determined as the most important risk factors in computer users regarding MSCs.

Keywords: Musculoskeletal complaints; Ergonomics; Office workers; Computer use; Individual factors

1. INTRODUCTION

The advances in technology and the communications systems, developments in the service sector, and increased involvement of computers in daily life have improved living conditions, but the extensive use of computers has also led to the emergence of new health problems (Durant, Fılacchıone, & Guıllo, 2006; Gerr, Marcus, & Monteilh, 2004). The health problems among office workers are mainly caused by repetitive movements and remaining still for long periods of time. An office worker who types or logs/analyzes data on the computer for extended periods suffers the effects of repetitive movements performed with the fingers, wrists, and elbows. Remaining still for long periods of time may also lead to problems in the neck and back. Job-related musculoskeletal system diseases known as "repetitive strain injuries" in the medical literature affect mostly the hand, arm, shoulder, and neck in computer users (Eltayeb, Staal, Kennes, Lambers, & de Bie, 2007; Hall & Morrow, 1988). The relationships between the factors contributing to musculoskeletal system complaints (MSC) of the upper extremities and the neck, and the physical

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and psychosocial risk factors in the workplace, have been investigated in critical studies (Bernard 1997; Devereux, Vlachonikolis, & Buckle, 2002; Hagberg, Silverstein, & Wells, 1995). MSC was most frequently associated with work conditions such as duration of daily computer use, work posture, frequency of breaks, and frequency of mouse clicking (Bergqvist, Wolgast, Nilsson, & Voss, 1995; Bongers, Kremer, & Lack, 2002; Cook, Burgess-Limerick, & Papalia, 2004). Although these complaints may be of mild to moderate severity, they may also become chronic and debilitating. Risk factors in computer users and their association with loss of work have been well documented. Differences in data collection methodologies (self-reported, video record, physical examination) and a combination of various factors such as study conditions, ergonomics, and individual factors, however, result in different prevalence and loss-of-work figures (Aaras, Fostervold, Ro, Thoresen, & Larsen, 1997; Wahlström, 2005). Our aim was therefore to determine the prevalence of MSC, its association with job-related risk factors (duration of daily computer use [hours], duration at the same job [years], frequency and duration of breaks taken, rest position), and the rate of absenteeism in a workplace where all the employees work on computers.

2. MATERIALS AND METHODS

All the office-workers ($n = 386$) in the workplace were included in the study, but only 86.3% ($n = 333$) completed the questionnaire. All the workers were responsible for data entry on the computer.

A modified version of the questionnaire developed by the National Institute of Occupational Safety and Health (NIOSH) was used for data collection. None of the questions were changed, but some new ones were added to the questionnaire (Bernard, 1997). The workers were questioned for sociodemographic characteristics, work characteristics, and MSCs using the questionnaire, which consisted of four headings: 1) demographic information (1 to 7); 2) work characteristics (duration of computer use every day, length of time at the same job, duration and frequency of breaks, general activity or exercise during the break, presence or absence of exercise specifically for the upper extremities during the break) (8 to 37); 3) MSCs (pain in the back, low back, neck, wrist, elbow; pain and numbness in the fingers and arm) (38 to 45); 4) reason and number of days of absenteeism (46 to 48).

2.1. Statistical Analysis

Data analysis was performed using the Statistical Package for Social Sciences (version 11.5; SPSS, Chicago, IL). Metric discrete variables were shown as mean $\pm$ standard deviation, whereas percentages were used for categorical variables. The chi-square test was used to assess the statistical significance of differences between the groups for the frequency distribution of categorical variables unless the expected cell size was less than five when Fisher's exact test was used. Logistic regression analysis was used to determine potential confounding effects. Any variable with a univariable test of a value of $p < 0.25$ was considered a candidate for the multivariable model along with all the variables of known clinical importance. The odds ratio and 95% confidence intervals for all the independent variables were also calculated. A value of $p < 0.05$ was considered statistically significant.

3. RESULTS

Of the employees included in the study, 73 (21.9%) were women and 260 (78.1%) were men. Workers' sociodemographic characteristics, working hours, and length of time in the same job are presented in Tables 1 and 2. The mean age of the workers was 36.9 ± 8.75 years (min = 18; max = 69). The mean age of the men (38.6 ± 8.85 years) was higher than that of the women (31.2 ± 5.27 years). The level of education of the workers was as follows: 67.9% were university graduates, 20.4% completed only high school, 7.8% completed only junior high, and 3.9% completed only elementary school. Of the workers, 12 (3.6%) worked fewer than 2 hours; 61 (18.3%) worked 2 to 5 hours; 160 (48%) worked 5 to 8 hours, and 100 (30%) worked more than 8 hours a day. Analysis of the work duration in years revealed that 31.2%, 22.8%, and 35% of the workers had been working at the same job for 1 to 5, 5 to 10, and more than 10 years, respectively.

The percentage of MSCs distributed by anatomical area according to gender is presented in Figure 1. Most of the workers (80.8%) had complaints, among which the most commonly reported were back and neck symptoms (58.6% and 58.3%) followed by complaints in the low back, shoulder, and hand (41%, 30.3%, and 23.7%), and finally in the knee, upper arm, and elbow (16.8%, 15%, 14.4%). All the complaints were more frequent in the women.

TABLE 1. Certain Personal Characteristics of the Workers Participating in the Study

	Personal Characteristics	*n*	%
Marital Status	Married	240	72.1
	Single	86	25.8
	Other(divorced, widowed)	7	2.1
Education	Primary school	13	3.9
	High school	68	20.4
	Higher education	26	7.8
	University	226	67.9
Employment Duration at this Workplace	Less than 12 months	36	10.8
	13 months – 5 years	104	31.2
	5–10 years	76	22.8
	More than 10 years	117	35.1
Daily Desk Work Hours	Less than 2 hours	12	3.6
	2–5 hours	61	18.3
	5–8 hours	160	48
	More than 8 hours	100	30
Gender	Female	73	21.9
	Male	260	78.1

The association of MSCs with duration of work was investigated. Employees who performed desk work 5 hours a day had a statistically significantly higher rate of complaints regarding pain in shoulders ($p = 0.003$), neck ($p = 0.004$), and back ($p = 0.026$) and numbness in fingers ($p = 0.023$) (Table 3). Additional complaints, such as wrist pain ($p = 0.044$), lower back pain ($p = 0.017$), and pain and numbness in the arm ($p = 0.032$), developed with increased duration of work hours (6 hours or more) with all of the complaints, excluding pain in the elbows and knees, observed at statistically significantly higher rates. The values showing the relationship between the length of time at this workplace (duration of work at the same job) and complaints are provided in Table 4. Although the rate of complaints in persons who had worked less than 12 months was relatively low, the rates of complaints were significantly higher in persons who had worked for 1 to 5 years. There was a significant correlation between the number of years of employment in this workplace and the complaints of the participants. Wrist pain ($p = 0.007$), shoulder pain ($p = 0.004$), neck pain ($p = 0.025$), back pain ($p = 0.012$), and pain in the arm ($p = 0.014$) were significantly higher in persons who had worked at the same job for more than a year.

Pain and numbness spreading to the arms was statistically significantly more prevalent ($p = 0.031$) in the workers who had a break after 2 hours of work

TABLE 2. Certain Personal Characteristics of the Workers Participating in the Study

Variables	Gender	Mean (min-max)	±*SD*
Age	Female	31.18 (18-55)	±5.27
	Male	38.62 (20-69)	±8.85
	Total	36.9 (18-69)	±8.75
Height	Female	165.3	±4.96
	Male	176.4	±6.25
	Total	174	±7.56
Weight	Female	58.44	±6.95
	Male	82.62	±10.72
	Total	77.32	±14.16

Note. *SD:* standard deviation.

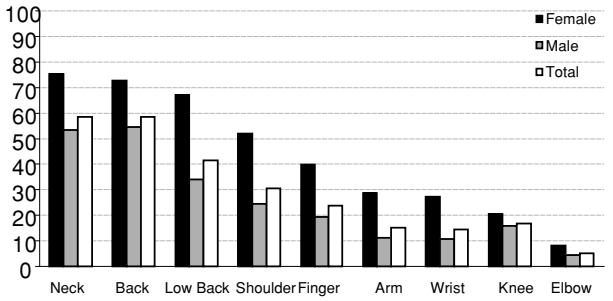

Figure 1 Percentage of MSCs distributed by anatomical area according to gender.

TABLE 3. Relationship between Desk Work Hours and Complaints

	Less than 5 hours		More than 5 hours			
Complaints	*n*	%	*n*	%	κ^2	*p*
Wrist	7	9.6	41	15.8	1.765	0.386
Elbow	3	4.1	14	5.4	0.191	0.584
Shoulder	12	16.4	89	34.2	8.534	0.003*
Knee	13	17.8	43	16.5	0.066	0.789
Low Back	24	32.9	135	51.9	1.307	0.253
Arm (pain and numbness	7	9.6	43	16.5	2.157	0.142
Hand (pain and numbness	10	13.7	69	26.5	5.193	0.023*
Tension and Stiffness in Neck Muscles	26	35.6	168	64.6	19.71	0.004*
Tension and Stiffness in Back Muscles	31	42.5	164	63.1	9.978	0.026*

*$p < 0.05$ statistically significant.

when compared to those that had a break more frequently. There were no relationships between the other complaints and break frequency. We also investigated the association of the break duration with the complaints. Stiffness and pain in the neck and back muscles were significantly more common ($p = 0.007$, $p = 0.024$) in persons who took shorter breaks (5 to 15 minutes). No statistically significant relationships were determined between the other complaints and the duration of breaks. How the break was used was as important as the duration of the break. Employees who exercised the upper extremities and back muscles during the break showed lower rates of wrist and elbow joint pain ($p = 0.007$ and $p = 0.033$) and back pain complaints ($p = 0.019$). Furthermore, the female workers had statistically significantly higher rates for all of the complaints, excluding pain in the elbows and knees ($p < 0.01$).

The logistic regression analyses of the complaints versus risk factors are presented in Table 5. Using logistic regression analysis, the risk factors that had significant effects as determined by univariable statistics as well as risk factors with potential significant effects in multivariable models were studied. Table 5 shows the correlated risk factors ($p < 0.05$*) as well as nonrelated risk factors ($p > 0.05$). According to the logistic

TABLE 4. Relationship between Duration of Desk Work at the Same Job and Complaints

	Less than 1 year		Between 1 and 5 Years		5–10 Years		More than 10 Years			
Complaints	*n*	%	*n*	%	*n*	%	*n*	%	κ^2	*p*
Wrist	5	1.5	25	7.5	8	2.4	10	3.0	12.013	0.007*
Elbow	1	0.3	6	1.8	5	1.5	5	1.5	1.005	0.787
Shoulder	5	1.5	38	11.4	31	9.3	27	8.1	13.35	0.004*
Knee	5	1.5	17	5.1	12	3.6	22	6.6	0.625	0.089
Low Back	12	3.6	52	15.6	34	10.2	40	12.0	6.991	0.072
Arm (pain and numbness	4	1.2	31	9.3	23	6.9	22	6.6	9.706	0.014*
Hand (pain and numbness	5	1.5	32	9.6	21	6.3	21	6.3	7.575	0.056
Tension and Stiffness in Neck Muscles	20	6.0	69	20.7	49	14.7	56	16.8	9.312	0.025*
Tension and Stiffness in Back Muscles	19	5.7	69	20.7	51	15.3	56	16.8	10.897	0.012*

*$p < 0.05$ statistically significant.

regression analysis, determinant factors for wrist, shoulder, neck, and back pain and pain/numbness spreading to the arm were computer use longer than 6 hours and female gender. The low back pain complaint was associated with only female gender. Working for more than 2 hours without a break also had an effect on pain and numbness spreading to the arm.

Furthermore, the percentage of workers who reported being absent from work within the past year due to MSCs was 11.7%. Absenteeism rates are given in Table 6. The rate of absenteeism was statistically significantly higher in employees with complaints than in those who did not have any complaints ($p = 0.042$). No significant relationships were found, however, between the anatomical area that gave rise to the complaint and absenteeism as well as between gender and absenteeism ($p = 0.25$, $p = 0.0742$).

4. DISCUSSION

The increasing involvement of computers in daily life has resulted in an increase in MSCs in office workers, causing loss of time and efficiency. Reports on MSC prevalence range from 10% to 86% in the literature (Shuval & Donchin, 2005; Wahlström, 2005; Woods, 2005). The prevalence of MSCs (self-reported) (80.8%) was considerably high. Differences in methodologies used in the studies (self-reported, video record, physical examination), psychosocial factors, and the various ergonomic and working conditions yield different prevalence rates.

The most common complaints were back and neck symptoms (58.6% and 58.3%), followed by low back, shoulder, and hand complaints (41%, 30.3%, and 23.7%). Earlier studies have reported high rates for neck and shoulder complaints (Cook, Burgess-Limerick, & Chang, 2000; Eltayeb et al., 2007; Jensen, Finsen, Sogaard, & Christensen, 2002; Shuval & Donchin, 2005). Similarly, in this study, neck (58%) and shoulder (30%) complaints were the most common. Furthermore, there was also a high incidence of back and low back complaints. We believe that these high MSC rates may be related to the 5-hour or longer work carried out by 78% of the office workers and by working at the same job for more than 5 years. The study by Marcus, Gerr, and Monteılh (2002) demonstrated back pain and neck and upper extremity discomfort to be the most frequent symptoms among MSCs. The study by Grandjean, Hunting, and Nishiyama (1984) on 261 male and 117 female office workers analyzed sitting-related health complaints and found back and low back pain symptoms in 57% of the workers.

Demure and colleagues (2000) found low back pain to be associated with awkward posture and working for 7 or more hours. Back and low back pain were also associated with extensive work periods and gender in our study.

The number of hours spent typing appears to be a risk factor for MSCs among computer users. Many large-scale studies showed an increase in MSC prevalence with increasing hours spent typing (Bernard, Sauter, Fine, Petersen, & Hales, 1994; Karlqvist, Tornqvist, Hagberg, Hagman, & Toomingas, 2002; Yun, Lee, Eoh, & Lim, 2001). In the study by Shuval and Donchin (2005), the rate of complaints in workers who worked for 7.1 to 9 hours was higher compared to the rate of the complaints in workers who worked for 7 hours. The number of hours spent typing appears to affect neck and shoulder conditions more but is less consistent for hand and arm outcomes (Gerr, Marcus, & Monteilh, 2004). Studies showing just the opposite also exist, however. The duration of computer use was more consistently associated with hand/arm than with neck/shoulder symptoms (Gerr et al., 2004, Shuval & Donchin, 2005). In addition, in their review, IJmker and colleagues (2007) have added to the existing literature that the duration of mouse use was more strongly and consistently associated with the incidence of hand/arm symptoms than was the duration of total computer use and keyboard use. A possible dose-response relationship was found for this association (IJmker et al., 2007). The results of our study, similar to those in the literature, indicate that the level of complaints increased with longer daily computer use. The complaints in the shoulder, neck, back, and fingers were found at higher rates in the office workers who worked for 5 hours daily. The office workers who worked 6 or more hours a day also had wrist and low back pain. Nevertheless, duration of work had no effects on elbow and knee pain. When compared to the other risk factors (age, gender, frequency and duration of breaks), only the duration of work was found to have an effect on all kinds of MSCs. Some studies, however, have found no relationship between complaints and duration of work (Evans & Patterson, 2000; Nelson & Silverstein, 1998).

We found a higher prevalence of all kinds of MSCs in the female office workers. The most common complaint was tension and pain in the back muscles in

TABLE 5. Results of Multiple Retrospective Logistic Regression Analysis of the Risk Factors for MSCs among Office Workers ($n = 333$)

Variables	Odds Ratio	95% Confidence Limit	*p* Value
Wrist Joint Pain			
Still rest position	2.172	(1.156-4.083)	0.016*
Female gender	2.960	(1.537-5.700)	<0.001*
More than 5 hours of computer use	1.104	(0.415-2.942)	0.842
More than 6 hours of computer use	2.344	(1.225-4.484)	0.010*
Elbow Joint Pain			
Still rest position	2.804	(1.029-7.641)	0.044*
Female gender	1.411	(0.477-4.171)	0.533
More than 5 hours of computer use	2.230	(0.767-6.483)	0.141
More than 6 hours of computer use	2.955	(1.074-8.126)	0.061
Shoulder Joint Pain			
Age	1.007	(0.973-1.042)	0.699
Still rest position	1.328	(0.823-2.567)	0.403
Female gender	2.977	(1.718-5.160)	<0.001*
More than 5 hours of computer use	1.429	(0.671-3.043)	0.344
More than 6 hours of computer use	2.764	(1.433-5.331)	0.002*
Low Back Pain			
Age	0.999	(0.964-1.035)	0.940
Still rest position	1.288	(0.725-2.287)	0.388
Female gender	3.923	(2.260-6.809)	<0.001*
More than 5 hours of computer use	1.044	(0.649-1.6809	0.858
More than 6 hours of computer use	1.527	(0.849-2.745)	0.157
Working period in the same job (more than 5 years)	1.033	(0.597-1.790)	0.907
Arm (pain and numbness)			
Age	1.030	(0.984-1.078)	0.207
Still rest position	0.421	(0.168-1.053)	0.604
More than 5 hours of computer use	1.174	(0.439-3.142)	0.749
More than 6 hours of computer use	3.253	(1.225-8.642)	0.018*
Female gender	2.757	(1.434-5.300)	0.002*
Bent head position	0.414	(0.165-1.039)	0.060
Breaks after more than 2 hours of work	1.996	(1.061-3.753)	0.032*
Hand (pain and numbness)			
Age	1.377	(0.817-2.323)	0.230
Still rest position	1.260	(0.733-2.167)	0.402
More than 5 hours of computer use	1.323	(0.584-2.996)	0.502
More than 6 hours of computer use	2.657	(1.286-5.488)	0.008*
Female gender	2.428	(1.371-4.298)	0.002*
Breaks after more than 2 hours of work	1.367	(0.809-2.311)	0.243
Tension and Stiffness in Neck Muscles			
Age	2.334	(1.050-5.186)	0.067
Still rest position	1.260	(0.733-2.167)	0.402
More than 5 hours of computer use	2.102	(1.130-3.913)	0.019*
More than 6 hours of computer use	2.135	(1.198-3.803)	0.010*
Female gender	1.970	(1.069-3.630)	0.030*
Breaks after more than 2 hours of work	1.367	(0.809-2.311)	0.243
Bent head position	2.105	(1.236-3.584)	0.006*
Tension and Stiffness in Back Muscles			
Age	1.000	(0.966-1.035)	0.990

(Continued)

TABLE 5. Continued

Variables	Odds Ratio	95% Confidence Limit	*p* Value
Still rest position	1.548	(0.946-2.534)	0.082
More than 5 hours of computer use	2.017	(1.086-3.747)	0.056
More than 6 hours of computer use	2.618	(1.575-4.353)	<0.001*
Female gender	1.881	(1.050-3.368)	0.034*
Breaks after more than 2 hours of work	1.711	(0.920-3.183)	0.090
Bent head position	1.212	(0.652-2.253)	0.542

both the women (78.1%) and the men (54.6%). The only complaints that did not show any statistically significant difference according to gender were elbow and knee pain. The review by Treaster and Burr (2004) shows that upper extremity problems, more frequently seen in women, are associated with factors such as the job performed; cultural, psychosocial, and biological factors; and the fact that women often perform jobs that are more repetitive and monotonous than those of men. The number of office workers included in this study is rather low, but studies in which only office workers were included also show women to have higher MSC rates than men. Other studies have also found a higher prevalence in women (Cook et al., 2000; Eltayeb et al., 2007; Marcus et al., 2002; Shuval & Donchin, 2005).

Although aging is known to contribute to disc degeneration, loss of flexibility in tendons, loss of muscle mass and strength, and reduced anaerobic capacity leading to a decreased work capacity (Brennan, 2002), the age factor was found to be of no importance in our study. Other studies have shown that being older than 40 is a risk factor for MSCs (Demure et al., 2000). The mean age of the workers was 36.9 years in our study, and the data showed an accumulation around this age. There was no statistically significant difference between the age of workers with complaints and the age of those without complaints.

TABLE 6. Distribution of Worker Absenteeism Due to Complaints

		n	%
Absenteeism due to sickness	No	281	84.4
	1–3 days	39	11.7
	4–7 days	4	1.2
	More than 7 days	5	1.5

Another risk factor in the literature is the duration of employment at the same job. Computer use in the workplace for more than 2 years was reported to constitute a risk factor for MSCs (Özcan, Esmaeılzadeh, & Bolukbası, 2007; Shuval & Donchin, 2005). Gerr and colleagues (2002) have found upper extremity complaints in more than 50% of the workers within the first year of their employment. The study presented here also shows a statistically significant association between employment duration at the same job and the complaints. The office workers who worked for more than 1 year in this workplace showed higher rates of wrist, shoulder, neck, back, and arm pain, and the difference was statistically significant.

Frequency and length of work are also important factors for MSCs. Frequent breaks enable muscles to regain their strength and improve their efficiency. Furthermore, resting before signs of fatigue appear is more effective. Time spent typing should not exceed 40 minutes. Many ergonomists believe that a minimum of 5 minutes of rest is required for every 40 minutes of work for maximum efficiency (Ulusam, Kurt, & Dülgeroğlu, 2001). A number of studies conducted on this subject generally agree on the necessity of 5- to 10-minute breaks every hour for computer users. There is a maximum time limit for work to obtain maximum efficiency in many jobs. Researchers usually determine this duration as 30 to 45 minutes. Frequent, short breaks should also be taken throughout the work cycle. Ten-second time-offs for every 10 minutes of work reduce fatigue dramatically (Pheasant, 1991), but 20- to 180-second micro time-offs for every 10 to 15 minutes should not be replacements for real breaks but considered supportive. A break at the end of each work period would both improve performance and reduce fatigue (Pheasant, 1991). It was

determined that the rest period should be 10% of total work duration and would not reduce efficiency. In our study, pain spreading to the arm and numbness were found at a significantly higher rate ($p = 0.031$) in employees who worked for more than 2 hours before a break. There were no demonstrable associations between frequency of breaks and other complaints. The relationship between duration of break and the complaints was evaluated. Tension and pain in the neck and back muscles were statistically more frequent ($p = 0.007$, $p = 0.024$) in workers who took shorter breaks (5 to 15 minutes of rest period). It was determined that the workers included in this study worked for long periods with relatively short rest periods, without micro breaks. To prevent MSCs, it is important to change posture and position during rest periods and to perform stretching exercises (Cook et al., 2004; Gerr et al., 2004). The rates of the complaints about wrist and elbow pain ($p = 0.007$ and $p = 0.033$) and pain in the back muscles ($p = 0.019$) were therefore significantly lower in the workers who were active during the break when the relationship between resting style and complaints was evaluated. A neutral position is the most convenient position for the wrist of a computer user. Keeping the wrist in an inconvenient position by leaving it flat on a surface causes a static loading effect on the wrist and elbow muscles that leads to contact stress. Blood circulation and neuronal impulse propagation are diminished in the working muscles as a result. Entrapment neuropathies are frequently seen in the wrist and elbow region due to narrowed tunnels. The lower frequency of wrist and elbow pain found in the workers who exercise during breaks (improving circulation) is therefore consistent with these observations.

Another aspect of this study that is of note was the rate of discomfort-related absenteeism, which was determined to be 11.7%. The workers with neck and shoulder pain and those with pain/numbness that spread to the arm showed higher rates of absenteeism. A study by Hagberberg, Tornqvist, and Toomingas (2002) reports MSC-related efficiency loss of 8% in computer users. A study by Hagberg, Vilheimsson, Tornqvist, and Toomingas (2007) showed extensive work- and job-related risk factors to be causative agents of loss of efficiency (self-reported). The authors also demonstrated that neck, shoulder, and arm-/finger-related loss of efficiency was higher in women than in men and that the loss decreased with physical exercise (Hagberg et al., 2007).

The weak points of this study may be data collection based only on the questionnaire (self-reported) and absence of physical examination. Methodological difficulties in following the vast number of employees via video-recording and their analyses have been described in the literature, however (Gerr, Marcus, & Ortiz, 1996). Moreover, other studies show that results obtained through a questionnaire-based approach were not different from those obtained after physical examination. For example, one study evaluated employees with neck/shoulder complaints with a questionnaire or through physical examination, and both methods generated similar results (Perreault, Brisson, Dionne, Montreuil, & Punnet, 2008). Contributions of other factors, such as posture, ergonomic conditions, and psychosocial parameters, were not evaluated here because the study was planned so that only the effects of working conditions were analyzed. There are no reports in the literature of a study in which all of the contributing factors have been evaluated. A need for research standardization in this field was also noted during our work.

5. CONCLUSION

We found a high prevalence of MSCs in office workers. The work-related risk factor with the most impact was duration of daily work. Other risk factors determined were employment for more than a year, breaks after more than 2 hours of work, short break duration, and not being active during a break. All the risk factors other than female gender can be modified, and MSC and related job efficiency losses can be decreased by informing the employers and employees and improving work conditions.

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