2008-5435/13/52-46-52
INTERNATIONAL JOURNAL OF OCCUPATIONAL HYGIENE
Copyright © 2013 by Iranian Occupational Health Association (IOHA)
IJOH 5: 46-52, 2013

ORIGINAL ARTICLE

Psychosocial and Occupational Risk Factors of Musculoskeletal Pains among Computer Users: Retrospective Cross-Sectional Study in Iran

ISAAC RAHIMIAN BOOGAR[1*], and MEHDI GHODRATI MIRKOUHI[2]

[1]*Department of clinical psychology, Faculty of Psychology & Educational Seinces, Semnan University, Semnan, Iran;*
[2]*Department of Psychology, Payam-noor University , Ghazvin Center, Ghazvin, Iran.*

Received August 18, 2012; Revised February 7, 2013; Accepted February 24, 2013

This paper is available on-line at *http://ijoh.tums.ac.ir*

ABSTRACT

Evaluation an etiological model with psychosocial and occupational risk factors has applied implication for therapeutic intervention. This research was aimed to investigate psychosocial and occupational risk factors of musculoskeletal pains among computer users in Semnan Province of Iran**.** In this cross-sectional study, 324 computer users from governmental offices and private industrial/organizational institutes in the province were enrolled by random sampling at the age of 25 to 63 yr old. Data were collected by Demographical-Occupational and Musculoskeletal pains history Questionnaire and a set of specialist-validated questions, the Depression Anxiety Stress Scales, Toronto Alexithymia Scale, and the Multidimensional Scale of Perceived Social Support. Gathered data were examined via binary logistic regression analysis. The mean age was 39.76±7.77 years, 48.8% were male and 51.2% were female. Age, duration of occupation, daily computer usage, incorrect body posture, work overload, poor ergonomic knowledge, social support, alexithymia, depression and somatization were significantly associated with musculoskeletal pains (p<.000). Daily computer usage (OR=18.408 [4.306-27.519]), incorrect body posture (OR=11.786 [2.864-24.528]), work overload (OR=8.725 [2.831-13.527]), poor ergonomic knowledge (OR=12.370 [6.520-20.095]), social support (OR=1.088 [1.034-1.144]), alexithymia (OR=1.934 [.897-2.971]), depression (OR=2.894 [.836-3.956]) and somatization (OR=13.032 [3.626-.25.546]) were significant predictors of musculoskeletal pains (p<0.001). Psychosocial factors, work-related factors and lack of support or appropriate ergonomic knowledge were all important correlates of musculoskeletal pains. Thus, efficient preventive plans require addressing all these aspects.

Keywords: *Somatization, Alexithymia, Ergonomic, Musculoskeletal pains*

INTRODUCTION

Suffering from musculoskeletal pains is frequent among computer users. Musculoskeletal pain is a main factor of disability and dysfunction among persons of working age in the world that has considerable socio-economic negative impact [1, 2]. In accord with recent studies, musculoskeletal pains are frequently experienced in various body locations in computer workers [1, 3]. Complaints of pains in neck, shoulders and arms are defined as the existence of musculoskeletal pains which these pains not happened by any systemic disease or serious traumatic event [3].

Complaints about neck, shoulders and arm pains is a apparent cause of occupational sickness that result in repeated absence from task, deficient quality of life, decreased global productivity and increased medical costs among computer users [4, 5]. Prevalence and risk

*** Corresponding author:** Isaac Rahimian Boogar, E-mail: e_rahimian@sun.semnan.ac.ir

factors of musculoskeletal pains in developing countries is so high that become important issue for study and intervention [5].

The etiology of musculoskeletal pains among computer workers is multifactor and partly unknown. In recent times, some studies have clarified possible work related risk factors for musculoskeletal pains (6, 7). Generally, occupational, socio-demographic and psychosocial factors have been involved in manifestation of musculoskeletal pains among computer users [6-8].

In occupational perspective, researches showed that repeating tasks, static physical postures and poor workplace conditions are hazardous for superior musculoskeletal extremity [6, 7]. Upon based the role of socio-demographic factors, in the recent study, age, sex and prior history of pains were taken into account as self-reliant risk factors of musculoskeletal pains [5]. Gender along with work stressors were important correlates of musculoskeletal disorders in some industries [9]. In addition, the number of musculoskeletal pain locations and localized musculoskeletal pains including low back, neck and shoulder pains were inclined to increase with become aged and longer duration of occupation [6, 7].

Some studies that addressed both the occupational and socio-demographic factors have presented interestingly outcomes. In accord with the recent study, female gender, wrong computer positioning, daily computer usage, wrong body posture, work overload, harmful work-habits and deficient social support were significantly correlated with neck and shoulder pains [5]. In a systematic review it has been discovered that higher daily computer usage, high workload, mental distress, and shortage of support in workplace are main risk factors for localized musculoskeletal pains [10]. In addition, ergonomically poorly designed workplace situations, poor ergonomic knowledge and prolonged periods of incorrect body posture at workplace contributes to musculoskeletal pains among computer workers [11, 12].

On the other hand, research emphases the important role of psychosocial factors in musculoskeletal pains. Poor social support provided by coworkers and superiors, lack of involvement in decision making and unfavorably task alterations were connected with deteriorated rapidly musculoskeletal pains [5, 12]. Moreover, musculoskeletal pains are strongly associated with psychological factors including depression, alexithymia and somatization, which have a more significant affects on various musculoskeletal pains [6, 13, 14].

Therefore, it is consequential that a causal model for musculoskeletal pains, take into account both psychosocial and occupational factors. Greater numbers of studies about risk factor are from western advanced countries and at this time there are little studies from developing nations in the Middle East region. The logical foundation of this model in Iran is that psychosocial factors and work environment has combined effect on musculoskeletal pains. The behavioral, physiological and worksite risk factors altogether impact on musculoskeletal symptoms of professional groups in computerized work environments [15,16]. Iran is a quickly developing country in Middle East and musculoskeletal problems among Iranian workers are partly prevalent [17]. Computer devices are being to an increasing degree utilized to encourage the fast industrial and organizational progression in Iran thereupon related negative effects also increasing. Therefore, musculoskeletal pains among computer users in Iran are probably to be leading factor for adverse individual, industrial and economical/financial consequences. In addition, identification and classification of the main risk factors of musculoskeletal pains and their reciprocal effects are valuable for management of these pains.

This study aimed to examine the existence of musculoskeletal pains in association with psychosocial and occupational risk factors and their expected interactions among computer users in an Iranian sample.

MATERIALS AND METHODS

Subjects

This cross-sectional study was administrated between Mar and Aug 2012. Three hundred twenty four computer workers from governmental offices and private industrial/organizational institutes in the Semnan Province of Iran were selected by random sampling at the age of 25 to 63 yr old then encouraged for the study. The mean age for participants was 39.76±7.77 years, also 48.8% (158 participants) were male and 51.2% (166 participants) were female.

The number of participants to be selected from each organization was decided by the likelihood corresponding to sample size (PPS) procedure contingent upon the proportion of computer users in each organization as settled by the Province Department of Census and Statistics. Informed consent in written format was acquired from each participant.

Employment of computer users in the present location for at least 12 months and use computers to finish their job obligations for at least 2 hours through day was inclusion criterion. Experiencing of diseases influencing the musculoskeletal domains such as Osteoarthritis, Rheumatoid arthritis, and additional onnective Tissue Disorders; having a prior surgical operations of the superior musculoskeletal extremity were exclusion criteria. Initially, a list of workers gratifying the inclusion criteria was earned from the department of human resources in the corresponding organizations; afterwards, they were screened for the existence of exclusion criteria. This ultimate list of computer users was earned by simple random sampling with using of computer produces numbers. Ultimately, the selected workers were politely requested for participation in the study.

This study was conducted in agreement with the Declaration of Helsinki and the participants took part in

Published online: January 31, 2013

a voluntary manner and completed informed consent. The data were analyzed on group format only and individual information was returned to ID codes.

Questionnaire and data collection

Validated Instruments were used for data collection on risk-factors of musculoskeletal pains. At first, psychometric characteristics of instruments was examined. Linguistic validation was performed by five experts whereby translated instruments are actively examined with experts in the target population and target language group by way of cognitive debriefing interviews. Moreover, Conceptual analysis was confirmed the linguistic validity of all instruments.

Self report collection of Demographical-Occupational and Musculoskeletal pains history Questionnaire (DOMPQ) and a set of specialist-validated questions were used in this study. DOMPQ inscribed details of age, gender, socioeconomic status, occupation related factors (qualitative data), duration of occupation, daily computer usage, incorrect body posture in workplace, work overload, ergonomic knowledge, tendency for somatization, duration of musculoskeletal pains (in months), and current therapeutic regimen (drugs, physiotherapy). In this questionnaire, each sort of issues was coded as present or not present. Other important comorbid diseases that demanding regular consideration or monitoring from physicians were inscribed as present or absent.

The existence of other important diseases was confirmed by critically examination of the inpatients/outpatients records. For assessing the level of ergonomic knowledge, participants were asked to define the "Ergonomics" term correctly and explain the correct postures in computer usage times or equipment putting implementation at the workplace. Musculoskeletal pains were assessed by using of demographic and medical history information. A six-month prevalence of shoulder, neck-occipital, low back pain, and peripheral pain (wrist, knee, ankle-foot, and elbow pain) was bringing out by these questions: "Have you had any pains or aches throughout the last six months in the following domains of your body?" 1) shoulders, 2) elbows, 3) occipital or neck area, 4) knees, 5) ankle-foot area, 6) wrists and 7) low back. The response choices for these anatomical domains were: 1) no, 2) yes, but I have not talked with a doctor, physical therapist, nurse or other health care professionals, and 3) yes, and I have talked with a doctor, physical therapist, nurse or other health care professionals. For additional analysis, anatomical pain with and without medical counseling were joined as one section.

Depression was assessed by The Depression Anxiety Stress Scales (DASS). Each of the three DASS scales comprises 14 items, which set apart into subscales of 2–5 items with similar content [18]. The DASS-Depression scale appraises despair, dysphoria, self-condemnation and depreciation of life, anhedonia, lack of interest/involvement, and inactivity. Answers are rated for the past week by utilizing of a 4-point severity or frequency scale extended from 0 "Didn't apply to me at all", 1 "Apply to me to some degree/some of the time", 2 "Apply to me a considerable degree/a good part of the time", to 3 "Apply to me very much/most of the time". DASS-Depression Scores were calculated by summing the scores for the respective items and converting the scores to equivalent percentile scores [19]. In initial sampling, the Cronbach's alpha for this scale was 0.87 [18]. Validity and reliability indicators of this scale are appropriate for Iranian samples [19].

Toronto Alexithymia Scale (TAS-20) that is the 20-item tool which as the most famously used way for assessing the alexithymia was used in this study [20]. This scale is composed of three subscales: Externally Oriented Thinking (EOT), Difficulty Describing Feelings (DDF) and Difficulty Identifying Feelings (DIF). The validity of the TAS-20 scale as a whole and validity of the DIF and DDF subscales has been verified to be outstanding and excellent, while the validity indicators of the EOT subscale is exclusively moderate [20]. The psychometric Properties of the scale including validity have been proven satisfactory and have been approved in two different statistical samples [21]. A cut-off point score of 61 or more were utilized for recognizing a participant as person with alexithymia [21]. For statistical analysis in this study, was dealing with the score of TAS-20 as a continuous variable. Internal consistency by Cronbach's α in this study for one Iranian sample was excellent for the total TAS scale (0.91) and satisfactory for the three subscales, EOT (0.73), DDF (0.81) and DIF (0.88).

Furthermore, a 12-item self-report tool of The Multidimensional Scale of Perceived Social Support (MSPSS) used for measure of perceived social support from threefold origin of significant Other, friends and family [22]. In a 7-point Likert scale, items are rated on extending from 1"strongly disagree" to 7 "strongly agree". The total score for the full scale extends from 12 to 84 and for each of subscales extends from 4 to 28. The whole scale and every one of its subscales have proven excellent internal reliability and validity [22]. There are evidences providing support that this scale is as a psychometrically good tool to be used in this domain as well [23]. Internal consistency (Cronbach's α) in this study in Iran was 0.89, which was excellent for this scale.

Statistical methods

The predictive relationships between psychosocial and occupational risk factors with musculoskeletal pains were depicted using binary logistic regression by calculating the odds ratios (OR) in 95% confidence intervals (95% CI) with PASW-18. Binary logistic regression was appropriate statistical approach for this individual-level analysis in prediction of categorical variable of musculoskeletal pain [24].

Published online: April 8, 2013

Table 1. Descriptive characteristics for study variables (n=324)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Age[a]	-											
2. Gender[b]	.06	-										
3. Duration of occupation[a]	.73***	.08	-									
4. Daily computer usage[b]	-.17**	-.05	-.14**	-								
5. Incorrect body posture[b]	-.05	.08	-.08	.13*	-							
6. Work overload[b]	.11*	.05	.11**	.30**	.34**	-						
7. Poor ergonomic knowledge[b]	-.12*	-.07	-.08	-.27**	.16**	.31**	-					
8. Social support[a]	.16**	.04	.10	.31**	-.25**	-.35**	-.29**	-				
9. Alexithymia[a]	.23**	-.04	.18**	.37**	.20**	.34**	.30**	-.38**	-			
10. Depression[a]	.24**	.09	.21**	.30**	.11*	.20**	.27**	-.20**	.25**	-		
11. Somatization[b]	-.08	.07	-.04	.28**	.14**	.27**	.28**	-.18**	.28**	.15**	-	
12. musculoskeletal pains[b]	.32**	.07	.30**	.53***	.38**	.57***	.53***	-.57***	.64***	.45**	.46**	-
M	39.76	-	10.34	-	-	-	-	47.10	52.36	27.94	-	-
SD	7.77	-	4.24	-	-	-	-	8.45	7.51	6.34	-	-

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

[a] Correlations for continuous variable are parametric (Pearson).

[b] Correlations for categorical variable are non-parametric (biserial or poin-biserial).

RESULTS

Prevalent domain of pains was neck and head 85 (26.2%), followed by shoulder and arm 82 (25.3%), forearm and hand 80 (24.7%), and multisite musculoskeletal pains 77 (23.8%). Eighty four percent of the participants had worked between 2-7 years in their recent situation. On the basis of upper musculoskeletal extremity pains among the total participants, 34.3% (111) had musculoskeletal pains and 65.7% (213) of the participants didn't experienced musculoskeletal pains. Somatization in group without musculoskeletal pains was 19.4% (63) and in group with musculoskeletal pains was 80.6% (261). In group without musculoskeletal pains, 56.8% (184) had proper ergonomic knowledge and in group with musculoskeletal pains, and 43.2 % (140) had proper ergonomic knowledge. Work overload was more prevalent in group with musculoskeletal pains, 56.5% (183) compared with group without musculoskeletal pains as 43.5% (141). Group with musculoskeletal pains had higher incorrect Body Posture in workplace as 52.8 % (171) compared with group without musculoskeletal pains as 47.2% (153). Seventy nine (24.4%) participants had daily computer usage higher than 9 hours, 120 (37%) had daily computer usage between 6 to 9 hours and 125 (38.6%) had daily computer usage lower than 5 hours. Table 1 summarizes the descriptive characteristics (correlation, mean and standard deviation) of this statistical sample.

According to the Table 1, age (r=.32, p<.001), duration of occupation (r=.30, p<.001), daily computer usage (r=.53, p<.001), incorrect body posture (r=.38, p<.001), work overload (r=.57, p<.001), poor ergonomic knowledge (r=.53, p<.001), social support (r=-.57, p<.001), alexithymia (r=.64, p<.001), depression (r=.45, p<.001) and somatization (r=.46, p<.001) were significantly associated with musculoskeletal pains.

Results of binary logistic regression analysis for prediction of musculoskeletal pains in terms of these predictors are presented in Table 2.

This model contained 11 predictors (age, gender, duration of occupation, daily computer usage, incorrect body posture, work overload, poor ergonomic knowledge, social support, alexithymia, depression, and somatization). According to the binary logistic regression analysis, daily computer usage (OR=18.408 [4.306-27.519]), incorrect body posture (OR=11.786 [2.864-24.528]), work overload (OR=8.725 [2.831-13.527]), poor ergonomic knowledge (OR=12.370 [6.520-20.095]), social support (OR=1.088 [1.034-1.144]), alexithymia (OR=1.934 [.897-2.971]), depression (OR=2.894 [.836-3.956]) and somatization (OR=13.032 [3.626-.25.546]) were significant predictors of musculoskeletal pains (p<0.001). The Nagelkerke's R^2 was 0.93 and the Hosmer-Lemeshow goodness-of-fit test was not significant (χ^2 = 2.70, p = 0.952).

In accord with these findings, persons with higher daily computer usage 18.408 (4.306-27.519) times greater than persons with lower daily computer usage experienced musculoskeletal pains. Incorrect body posture, work overload, poor ergonomic knowledge, low social support, higher alexithymia, higher depression, and higher somatization also increased the probability of musculoskeletal pain experiencing 11.786, 8.725, 12.370, 1.088, 1.934, 2.894 and 13.032 times greater than opposite status of these variables, respectively.

According to Table 2, the greatest predictor of the occurrence of musculoskeletal pains in this model was the daily computer usage with an odds ratio (OR) of 18.408; therefore, by controlling other variables in this model, persons with higher daily computer usage will experience musculoskeletal pains with about 19 times most likely than persons with moderate daily computer usage. Next to the daily computer usage, somatization, undesirable ergonomic knowledge, Incorrect body posture, work overload, depression, alexithymia, and social support were the most powerful predictors and were influenced occurrence of musculoskeletal pains with a possibility of 13.032 to 1.088 times, respectively. The entire model which included whole significant

Published online: January 31, 2013

Table 2. Results of binary logistic regression analysis for prediction of musculoskeletal pains (N=324)

Predictor	b	SE b	Wald	*P*	OR	95% CI
Age	.066	.117	.319	.572	.936	.744-1.177
Gender(1)	1.375	.990	1.927	.165	3.954	.568-19.538
Duration of occupation	.134	.202	.442	.506	.875	.589-1.298
Daily computer usage 6h<	4.259	1.428	8.895	.003	18.408	4.306-27.519
Incorrect body posture(1)	2.467	.941	6.873	.009	11.786	2.864-24.528
Work overload(1)	2.166	.892	5.902	.015	8.725	2.831-13.527
Poor ergonomic knowledge	2.964	.981	9.124	.003	12.370	6.520-20.095
Social support	-.084	.026	10.554	.001	1.088	1.034-1.144
Alexithymia	.069	.020	11.578	.001	1.934	.897-2.971
Depression	.112	.034	10.794	.001	2.894	.836-3.956
Somatization(1)	3.892	1.493	6.793	.009	13.032	3.626-23.546
Constant	-1.887	3.960	.227	.634	.151	

predictors, revealed that it possible to distinguish persons with musculoskeletal pains from persons without musculoskeletal pains (p<0.001).

In addition to the Hosmer-Lemeshow goodness of fit test, other of model fitness indicators such as omnibus tests about overall significant model with (χ^2 = 368.413, p<0.001) had high significant values (significance value was lesser than 0.05). Thus, the above model with a set of these predictors is an appropriate and fit logistic regression model. The values of the squared Cox and Snell model (Cox & Snell R^2) and the squared Nagelkerke (Nagelkerke R^2) were 0.679 and 0.939, respectively, and showed that between 67% (squared Cox and Snell) and 93% (squared Nagelkerke) of the variation of the criterion variable or occurrence of musculoskeletal pains may be elucidated by this set of predictors.

Finally, classification matrix of predictor variables for prediction of musculoskeletal pains was presented in this section. Dependent upon the classification matrix in this model, 98.1% of the participants were properly classified in the group without musculoskeletal pains (n=209 and 4 else incorrectly grouped). Also, 96.4% of the participants were properly classified to be in the group with musculoskeletal pains (n=107 and 4 else incorrectly grouped). Accordingly in the overall model, 97.5% of this sample was grouped correctly. Thereupon, logistic regression model was excellently fitted with these predictors for this data set of the present research.

DISCUSSION

This study is the initially extensive report on the psychosocial and occupational risk factors of musculoskeletal pains among computer users in Iran. Musculoskeletal complaints in upper extremity among computer workers are obviously to be connected with both work-related and psychosocial risk factors [1, 6, 11, 25].

This study indicates that in the occupational and work-related factors, duration of occupation, daily computer usage, incorrect body posture, work overload, and poor ergonomic knowledge were significantly correlated with musculoskeletal pains. Among these factors, daily computer usage, incorrect body posture, work overload and poor ergonomic knowledge were also significantly predictors of the severity of musculoskeletal pains among this statistical population. In previous studies, increased daily computer usage, incorrect body posture and work overload were also consistently associated with musculoskeletal complaints and its severity [4, 10, 28].

In addition, in the present study workplaces with incorrect ergonomically designed and poor ergonomically knowledge was associated with musculoskeletal symptoms. There is general agreement that deficient ergonomic knowledge at work situations results in musculoskeletal pains especially pain in the neck, shoulders and hand domains [26]. Holding the head and neck in a bent condition and laboring in this position for lengthened hours were together meaningfully correlated with neck pain [12]. Following to the principles of ergonomics including working with correct body posture may reduce exposure to work-related and physical risk factors for musculoskeletal pains [27]. Work overload especially physically demanding workloads also increased the risk factors of musculoskeletal complaints [28]. Increased physically requesting workloads had a firm connection with the quantity of musculoskeletal pain locations particularly for common or disabling pain [29].

In this study, psychosocial factors including social support, alexithymia, somatization and depression are too significant predictors of musculoskeletal pains among computer users. Higher social support in workplace as a protective factor revealed convincing and statistically significant correlations with musculoskeletal pains [12]. Job related social support was serving as protective factors for musculoskeletal pains and negatively associated with any musculoskeletal pain [29].

Psychological factors including depression, higher alexithymia and somatization were statistically significant and very strongly correlated with multisite musculoskeletal pains [13, 16]. Lower alexithymia diminished significantly happening of any musculoskeletal pain [13]. The number of aching

Published online: April 8, 2013

musculoskeletal sites was powerfully related to both somatization and physically workload, and as well meaningfully associated with work-based psychosocial agents [13]. Depression, stress and physical activity in relation to computer use are main factors in musculoskeletal pains including low back, arm and neck/shoulder pains [14].

It seems that the relative significance of psychological factors as compared to occupational/work-related and physical risk factors is resembled for occurrence of musculoskeletal pains.

High workload and shortage of support from coworkers and superiors are the main risk factors for musculoskeletal pains [10]. The resemblance among odds ratios of the recognized psychosocial and occupational factors in the present research might mention a same contribution by two set of factors in the generation of musculoskeletal pains. Nonetheless, strategies aimed at alteration of psychosocial and occupational/work-related factors such as promotion of social support and ergonomic adjustment could be beneficially more effective in an employers' viewpoint. Hence, execution of a work situation ergonomics plans are known to be efficient in diminishing work-related displeasure and complaints in the manpower [30]. Furthermore, awareness plans are also understood to be productiveness in relation to costs for employers', as it decreases the happening of pain manifestations, make betters productivity and decreases medical costs [30].

In the present study, age, gender and duration of occupation were not statistically significant and did not have strong correlation with musculoskeletal pains. This result was inconsistent with bulk of previous studies. These findings may be result from various methodologies in studies including sampling and different sample size, diversity in instruments that used for data gathering, various definitions about assessed concepts and different conceptual models of the studies. On the other hand, among all predictors in this study intervening in the significant ones were very important.

Our study had several strengths on methodological perspective. The study sample was selected by simple random sampling then persons were invited to participate in this study according to the study criteria. In addition, an upward response rate was obtained from eligible participants. This study had various shortcomings. The reporting of musculoskeletal pains may have been biased as a result of the reality that participants was required to tell complaints that happened in the past year which might have ended in remembering bias. Data collection was established upon self-report administered instruments, and similar to numerous other researches, no clinical procedures of musculoskeletal pain were used. Moreover, the present report is a cross-sectional study, so to infer a causal relationship among musculoskeletal pains and possible risk factors proper studies are unavoidable. With regard to these possible origins, it seems logical to infer that these psychosocial and occupational factors are main determinants of musculoskeletal pains.

CONCLUSION

Psychosocial factors, occupational/work-related factors and lack of support or appropriate ergonomic knowledge were all important correlates of musculoskeletal pains. Thus, efficient preventive plans require addressing all these aspects. In addition, studies on distinctive preventive and interventional patterns are demanded to building an efficient preventive plans or methods for this important problem. In addition, coming studies should investigate the difference between main risk factors for musculoskeletal pains at multiple musculoskeletal sites as compared to the pain at only a one anatomical site.

ACKNOWLEDGEMENTS

We want to express gratitude the staff and employees of the governmental offices and private industrial/organizational institutes for their voluntary agreeableness to participate in this research. In addition, we want to express gratitude the managers for their contribution in coordinating the study implementation. The authors declare that there is no conflict of interest.

REFERENCES

1. Paananen MV, Auvinen JP, Taimela SP, Tammelin TH, Kantomaa MT, Ebeling HE, et al. Psychosocial, mechanical, and metabolic factors in adolescents' musculoskeletal pain in multiple locations: a cross-sectional study. *Eur J Pain* 2010;14(4):395-401.
2. Kiss P, De Meester M, Kruse A, Chavée B, Braeckman L. Neck and shoulder complaints in computer workers and associated easy to assess occupational factors--a large-scale cross-sectional multivariate study. *Int Arch Occup Environ Health* 2012; 85(2):197-206.
3. Huisstede BM, Miedema HS, Verhagen AP, Koes BW, Verhaar JA. Multidisciplinary consensus on the terminology and classification of complaints of the arm, neck and/or shoulder. *Occup Environ Med* 2007; 64: 313-319.
4. Eltayeb SM, Staal JB, Khamis AH, de Bie RA. Symptoms of neck, shoulder, forearms, and hands: a cohort study among computer office workers in Sudan. *Clin J Pain* 2011; 27(3):275-81.
5. Ranasinghe P, Perera YS, Lamabadusuriya DA, Kulatunga S, Jayawardana N, Rajapakse S, et al. Work related complaints of neck, shoulder and arm among computer office workers: a cross-sectional evaluation of prevalence and risk factors in a developing country. *Environ Health* 2011; 4(10):70.
6. Griffiths KL, Mackey MG, Adamson BJ. Behavioral and psychophysiological responses to job demands and association with musculoskeletal symptoms in computer work. *J Occup Rehabil* 2011; 21(4):482-92.
7. Malińska M, Bugajska J. The influence of occupational and non-occupational factors on the prevalence of musculoskeletal complaints in users of portable computers. *Int J Occup Saf Ergon* 2010;16(3):337-43.
8. Sharan D, Parijat P, Sasidharan AP, Ranganathan R, Mohandoss M, Jose J. Workstyle risk factors for work related musculoskeletal symptoms among computer professionals in India. *J Occup Rehabil* 2011; 21(4):520-5.
9. Yang JF, Cho CY. Comparison of posture and muscle control pattern between male and female computer users with musculoskeletal symptoms. *Appl Ergon* 2012 Jul; 43(4):785-91.
10. Andersen JH, Fallentin N, Thomsen JF, Mikkelsen S. Risk factors for neck and upper extremity disorders among computers

Published online: January 31, 2013

users and the effect of interventions: an overview of systematic reviews. *PLoS One* 2011; 12; 6(5):e19691. Review.

11. Noack-Cooper KL, Sommerich CM, Mirka GA. College students and computers: assessment of usage patterns and musculoskeletal discomfort. *Work* 2009; 32(3):285-98.
12. Zakerian SA, Subramaniam ID. The relationship between psychosocial work factors, work stress and computer-related musculoskeletal discomforts among computer users in Malaysia. *Int J Occup Saf Ergon* 2009; 15(4):425-34.
13. Solidaki E, Chatzi L, Bitsios P, Markatzi I, Plana E, Castro F, et al. Work-related and psychological determinants of multisite musculoskeletal pain. *Scand J Work Environ Health* 2010; 36(1):54-61.
14. Diepenmaat AC, van der Wal MF, de Vet HC, Hirasing RA. Neck/shoulder, low back, and arm pain in relation to computer use, physical activity, stress, and depression among Dutch adolescents. *Pediatrics* 2006; 117(2):412-6.
15. Griffiths KL, Mackey MG, Adamson BJ. The impact of a computerized work environment on professional occupational groups and behavioral and physiological risk factors for musculoskeletal symptoms: a literature review. *J Occup Rehabil* 2007; 17(4):743-65. Review.
16. Helmus M, Schiphorst Preuper HR, Hof AL, Geertzen JH, Reneman MF. Psychological factors unrelated to activity level in patients with chronic musculoskeletal pain. *Eur J Pain* 2012; 16(8):1158-65.
17. Choobineh A, Tabatabaei SH, Mokhtarzadeh A, Salehi M. Musculoskeletal problems among workers of an Iranian rubber factory. *J Occup Health* 2007; 49(5):418-23.
18. Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behav Res Ther* 1995; 33(3):335-43.
19. Afzali A, Delavar A, Borjali A, Mirzamayn M. Psychometric characteristics of DASS-42 test based on a sample of high school students in Kermanshah. *J Behav Sci Res* 2007; 5(2):81–92.
20. Taylor GJ, Bagby RM, Parker JD. The 20-Item Toronto Alexithymia Scale. IV. Reliability and factorial validity in different languages and cultures. *J Psychosom Res* 2003; 55(3):277-83.
21. Säkkinen P, Kaltiala-Heino R, Ranta K, Haataja R, Joukamaa M. Psychometric properties of the 20-item toronto alexithymia scale and prevalence of alexithymia in a finnish adolescent population. *Psychosomatics* 2007; 48(2):154-61.
22. Zimet GD, Powell SS, Farley GK, Werkman S, Berkoff KA. Psychometric characteristics of the Multidimensional Scale of Perceived Social Support. *J Pers Assess* 1990; 55(3-4):610-7.
23. Bruwer B, Emsley R, Kidd M, Lochner C, Seedat S. Psychometric properties of the Multidimensional Scale of Perceived Social Support in youth. *Compr Psychiatry* 2008; 49(2):195-201.
24. Menard S. Applied logistic regression analysis, 2nd ed. Thousand Oaks, CA: Sage; 2002. 48p.
25. Eltayeb S, Staal JB, Hassan A, de Bie RA. Work related risk factors for neck, shoulder and arms complaints: a cohort study among Dutch computer office workers. *J Occup Rehabil* 2009 Dec; 19(4):315-22.
26. Waersted M, Hanvold TN, Veiersted KB. Computer work and musculoskeletal disorders of the neck and upper extremity: a systematic review. *BMC Musculoskelet Disord* 2010; 29(11):79. Review.
27. Driessen MT, Proper KI, Anema JR, Knol DL, Bongers PM, van der Beek AJ. Participatory ergonomics to reduce exposure to psychosocial and physical risk factors for low back pain and neck pain: results of a cluster randomised controlled trial. *Occup Environ Med* 2011; 68(9):674-81.
28. Kim IH, Geiger-Brown J, Trinkoff A, Muntaner C. Physically demanding workloads and the risks of musculoskeletal disorders in homecare workers in the USA. *Health Soc Care Community* 2010; 18(5):445-55.
29. Johnston V, Jull G, Souvlis T, Jimmieson NL. Interactive effects from self-reported physical and psychosocial factors in the workplace on neck pain and disability in female office workers. *Ergonomics* 2010; 53(4):502-13.
30. Povlsen B. Physical rehabilitation with ergonomic intervention of currently working keyboard operators with nonspecific/type II work-related upper limb disorder: a prospective study. *Arch Phys Med Rehabil* 2012; 93(1):78-81.

Published online: April 8, 2013