

Evaluation of Musculoskeletal Disorders in Sewing Machine Operators of a Shoe Manufacturing Factory in Iran

Mir Masih Moslemi Aghili,¹ Hasan Asilian,² Parinaz Poursafa³

Advisor to and Senior Expert with the Ministry of Health and Medical Education, Tehran,¹ Department of Environmental and Occupational Health, School of Medical Sciences, Tarbiat Modares University, Tehran,² Environment Research Center, Isfahan University of Medical Sciences, Isfahan,³ Iran.

Corresponding Author: Mirmasih Moslemi Aghili. (mmmaghili@yahoo.com).

Abstract

Introduction: A 15-year research conducted in USA showed that compensation expenses paid to workers for musculoskeletal disorders (MSDs) of back exceeded 128 million Dollars calculated on the basis of 0.97 Dollars per hour of work. In addition, according to the latest studies carried out in relation with disease burdens with risk factors in Iran, DALYs indices for low back pain, knee arthrosis and other musculoskeletal disorders have been reported to be 307772, 291305 and 872633 respectively, which have caused the work related diseases to occupy the second position in the country, after cardiovascular diseases. On the other hand, in accordance with occupational health indices of Iranian health ministry, 37% of all working population had had poor work postures with 15% of all working population had been working with inappropriate working tools in the year 2009.

Methods: This was a case study comparing exposed workers with control group using Standard Nordic Questionnaire in sewing machine operators of a shoe manufacturing factory in Iran. In this study, the mentioned questionnaires were filled out for the exposed group (25 sewing machine operators with average age of 43.5 years with work records of 16.8 years) and control group (15 employees from administrative department with average age of 39.8 years with work records of 13.4 years) which both were selected through simple random method.

Results: There were statistically significant differences in age between musculoskeletal disorders of right elbow ($p = 0.033$), thigh ($p = 0.044$), both knees ($p = 0.019$) and ankles ($p = 0.039$). There were also statistically significant association between gender and musculoskeletal disorders of right elbow ($p = 0.028$), thigh ($p = 0.026$) both knees ($p = 0.011$); right shoulder disorders ($p = 0.018$) and work records; disorders of both knees ($p = 0.031$) and number of cigarettes smoked.

Conclusions: In general, prevalence of disorders of cervical area, shoulders with hands, vertebral column, back, knees, thigh with feet were higher in exposed group due to poor work posture. Meanwhile, female workers were inflicted more than males. On the other hand, these disorders were seen more with increased work records and age in which, improvement of work postures, training for better execution of tasks and conducting periodic screening tests are being recommended.

Keywords: Musculoskeletal disorders, Nordic, Ergonomics (JPMA 62: S-20; 2012).

Introduction

Nowadays, technological development paying attention to the health of workers are inalienable, because we cannot attain a technology to be at the service of man without clearly determination of the man's position as an active motivating force while paying special attention to mental and physical health of the workers. This will be feasible only when we become able to control all pollutants in their work environment preventing development of various stresses caused by their work. It is to this reason that all attempts should be applied to make the work environment ever more suitable for employees.

On the other hand, musculoskeletal disorders are among the biggest health problems in the world.¹ Incongruence of work with man or vice versa with poor work postures have caused dangerous complications with locomotion organ disorders which has resulted in creation of multiple physical, mental and financial pressures, the reflection of which can finally be observed in the community. Attention to such problems is of importance, because in the one hand, the resulting disturbance in individual is either irreversible or needs very lengthy treatment, and on the other hand, it results in other sufferings with financial losses to the individual, his family, surroundings and the community in turn. Shoe manufacturing industry is among the industries with high prevalence of musculoskeletal disorders, because the workers of such industries perform sewing operations almost all of the time, which doing such jobs without observing the appropriate principles can result in irreversible damages to musculoskeletal system of the individuals. In this study, people working with sewing machines in shoe manufacturing industry were studied with to evaluate prevalence of musculoskeletal disorders among them.

In general, work related musculoskeletal disorders are caused from repetition with continuation of trauma or pressure on muscles, tendons, joints or bones in long run, due to repeated works without observing ergonomic principles. The most prominent example of them is different kinds of low back pain, which is almost a common disease with around 80% all people get inflicted with it at least once during their lifetime.

According to the latest studies carried out in relation with disease burdens with risk factors in Iran in the year 2004, musculoskeletal disorders occupy the second position after cardiovascular diseases among the work related diseases (Health Programs Office of Network Development Center, Ministry of Health and Medical Education, 2007). Diseases like musculo-tendinous pressure or strain/degenerative changes, stiffness with rigidity of vertebral column in the morning, radiating pain from sciatic nerve, epicondylitis, carpal tunnel syndrome can be considered as musculoskeletal disorders caused by not observing the proper regulations of doing the job.²⁻⁴ In accordance with the report of World Health Organization in 2002, low back pain constituted 37% of all occupational risk factors which occupies the first rank among

the diseases complications caused by work. Such high prevalence of complications at international levels have made the World Health Organization to name the first decade of the third millennium as "the decade of campaign against musculoskeletal disorders (as the silent epidemic)".

According to the latest studies carried out in relation with disease burdens of risk factors in Iran in 2004 (by the Health Programs Office of Network Development Center, Ministry of Health and Medical Education of Iran), DALYs indices for low back pain, knee arthrosis and other musculoskeletal disorders have been reported to be 307772, 291305 and 872633, respectively, which have caused the work related diseases to occupy the second position in the country after cardiovascular diseases. Therefore, analysis of risk factors of musculoskeletal disorders may encourage employees to observe ergonomic principles in their jobs and have a considerable influence on reducing related burdens of diseases that impose tremendous expenses each year to different communities including Iran.^{2,5,6} These measures, not only result in comfort with welfare of the employees by ensuring their health in work environment, but also will cause reduction of waste and improved productivity of human forces, whose final result will be to benefit the community.⁷

Methods

This study has been carried out on sewing machine operators of sewing saloons of a shoe manufacturing factory in Iran. The research type was case study and sampling was done through simple random method among exposed group (25 workers from sewing machine operators) and control group (15 employees from among administrative department personnel). Both exposed and control groups consisted of men and women and average age was 43.5 and 39.8 years for exposed and control groups, respectively. Average work record was 16.8 years for exposed group and 13.4 years for control group.

In this study, Nordic Standard Questionnaires were used which have shown to have an acceptable reproducibility⁸ and is of good credibility for analyzing musculoskeletal disorders.⁹ In fact, these standard questionnaires have got high reproducibility with credibility rates and can be used at extended levels¹⁰ to produce a relatively suitable image of prevalence of such disorders in areas from neck to thighs, and they are good tools for screening in this field.¹¹⁻¹³ After interviewing and filling out the questionnaires in both exposed and control groups, the data were analyzed with SPSS software and were statistically evaluated by paired t-test, correlation and regression.

Results

This was a study on production line workers operating sewing machines in a shoe manufacturing factory in Iran. These people worked with unsuitable tools at sitting position, on an unsuitable surface, completely bent forward over the work, at least for 8 working hours in two morning and

afternoon shifts. Control group members were from employees of administrative department, sitting on suitable chairs at the desks of suitable surface and alternative periods of sitting and plentiful time of walking during the 8-working hours. Standard Nordic Questionnaires were filled out for all participants, with they were interviewed and evaluated for sitting position and way of working. Considering the objectives of the study, relationship between work records, age, sex and cigarette smoking (number of cigarettes smoked a day) with musculoskeletal disorders were tested. The people with greater work records were more exposed to disorders of right shoulder (p = 0.018). There were correlations between age and disorders of right elbow (p = 0.033), thigh (p = 0.044), both knees (p =

0.019) and ankles (p = 0.039). There were also correlations between disorders of right elbow (p = 0.028), thigh (p = 0.026) and both knees (p = 0.011), and gender; right shoulder disorders (p = 0.018) and work records; and there was a

Table-1: Percentile of musculoskeletal disorders in different parts of body between the two exposed with control groups.

Organ	Exposed group (%)	Control group (%)
Neck	13.5	0
Right elbow	4.9	0
Left elbow	1.8	0
Both elbows	1.2	0
Right wrist	2.4	0
Left wrist	1.8	0
Both wrists	3.7	0
Right shoulder	3.7	0
Left shoulder	1.2	0
Both shoulders	9.8	0
Vertebral column	12.9	0
Back	15.3	0
Thigh	6.7	0
Right knee	1.2	0
Left knee	0.61	0
Both knees	12.3	0
Ankles	6.7	0
Cumulative percent	100	0

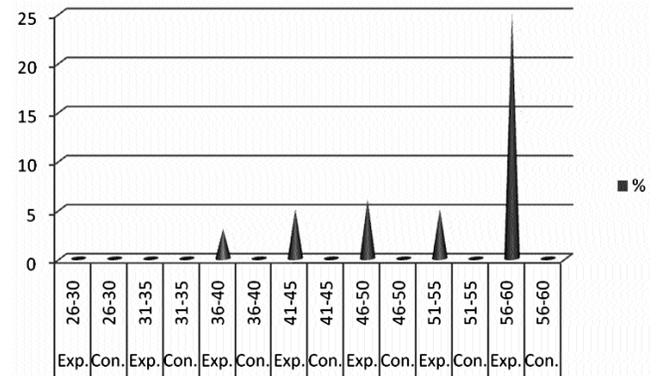


Figure-1: Prevalence of right elbow disorders in the two exposed with control groups by age groups.

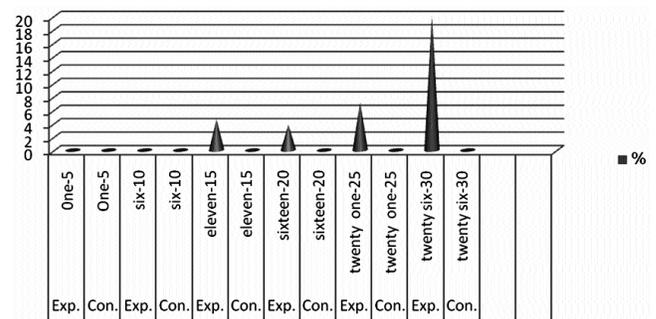


Figure-2: Prevalence of right elbow disorders in the two exposed with control groups by work records.

Table-2: Percentile of musculoskeletal disorders in different parts of body between the two exposed with control groups divided by gender.

Sex Organ	Male		Female	
	Exposed group (%)	Control group (%)	Exposed group (%)	Control group (%)
Neck	14.5	0	11.3	0
Right elbow	3.6	0	7.5	0
Left elbow	2.7	0	0	0
Both elbows	0.9	0	1.9	0
Right wrist	1.8	0	3.8	0
Left wrist	1.8	0	1.9	0
Both wrists	3.6	0	3.8	0
Right shoulder	4.5	0	1.9	0
Left shoulder	0.9	0	1.9	0
Both shoulders	10	0	9.4	0
Vertebral column	13.6	0	11.3	0
Back	14.5	0	17	0
Thigh	6.4	0	7.5	0
Right knee	0.9	0	1.9	0
Left knee	0.9	0	0	0
Both knees	11.8	0	13.2	0
Ankles	7.3	0	5.7	0
Cumulative percent	100	0	100	0

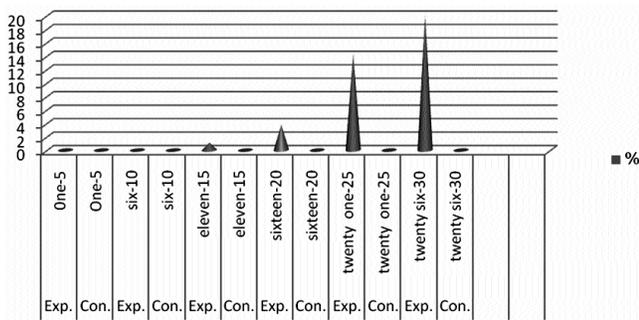


Figure-3: Prevalence of right shoulder disorders in the two exposed with control groups by work records.

significant relationship between disorders of both knees ($p = 0.031$) and cigarettes smoking habit.

In addition, the present study showed that prevalence of disorders of cervical area, shoulders and hands, vertebral column, back and knees were higher in exposed group (Table-1). Furthermore, women were at greater risk of getting inflicted with musculoskeletal disorders compared to men (Table-2). Meanwhile, the most prevalent age group inflicted was the age group of 60 to 65 years (Figure-1); and the most prevalent group of work records was the group with work records of 26 to 30 years (Figure-2 and 3).

Discussion

In this study, it was observed that musculoskeletal disorders of right elbow were in correlation with age ($p = 0.033$) and gender ($p = 0.028$). There were also significant relationship between disorders of right shoulder and work records ($p = 0.018$); between disorders of thigh and age ($p = 0.044$); between disorders of thigh and gender ($p = 0.026$); between disorders of both knees and age ($p = 0.019$); between disorders of both knees and gender ($p = 0.011$); and between disorders of both knees and number of cigarettes smoked ($p = 0.031$). A correlation also existed between ankle disorders and age ($p = 0.039$). Furthermore, prevalence of disorders of cervical area, both shoulders, vertebral column, back and both knees revealed that doing sewing work for a long period in an unsuitably seated position¹⁴ has been a causative factor due to non-standard working posts including work desks and chairs, causing workers to bend their back excessively and sit on the chair inappropriately in order to get more dominant upon their work. At this position, on the one hand, muscles remain static for a very long period of time, and on the other hand, more energy is expended for doing the determined duty, and therefore, this study proves the reports of the Environment and Work Health Center, Iranian Ministry of Health in relation with musculoskeletal disorders (Reports of the Environment and Work Health Center, Iranian Ministry of Health, 2009). It was also observed that working in unsuitable conditions and little rest of muscles of hand in exposed group in this study were

very similar to conditions of computer operators and caused high risks of disorders of hand and elbow,¹⁵ and so, allocation of resting time during working hours and physical workouts should be placed in the agenda.¹⁶ It was also established that women were inflicted with musculoskeletal disorders more than men, which is in congruence with the study of Stergreen and colleagues.¹⁷ In general, it has been established in some studies that gender had a strong relationship with musculoskeletal pains of cervical area and lower part of the body of the workers^{18,19} which can be attributed to physiological structure and metabolic system of women with regard to their different life cycles like monthly menstrual periods and menopause causing porosity and weakness of skeletal system. On the other hand, although women are expected to be exposed to higher environmental risk factors,²⁰ men are also more susceptible in many instances²¹ resulting in limitation of their physical activities due to musculoskeletal disorders at a rate of 6.6%.²² It was also shown in this study that 56-60 years age group and 26-30 years work records group had the highest involvement; meaning that increased age over 56 years and increased work records over 26 years were associated and increased musculoskeletal disorders of shoulder area and right elbow of sewing machine operators. In a study conducted by Helsing, it has also pointed out that lower back area pain was increased from 38% to 73% and increased work records.²³ Statistical evaluations also showed that there was a strong relationship between intensity of musculoskeletal pain and repeated use of one hand and also work records in weavers and other occupations having sewing functions.²⁴ In another study conducted on garment producing workers, it was established that work records and gender were effective in some musculoskeletal disorders²⁵ and people with higher work records or people of higher ages in these occupations, may get more absence from work and experience more severe signs of relatively pains.²⁶ Furthermore, development of such disorders in people of higher ages and higher work records, can imply that these disorders are work related diseases, since work related diseases are developed in long term due to repeated non-standard movements or contacts of the individual, which again is a result of not observing ergonomic regulations and standards in designing work posts and also inappropriate body position during work or poor work posture. On the other hand, results of some researches show that in spite of extended and ever increasing mechanization and automation, prevalence of work related musculoskeletal disorders is still high^{20,27,28} and is considered the main cause of working time loss, increased expenses and human force injuries and one of the biggest occupational health problems in industrial countries including Iran. Helsing and Bring Elson showed in a study that musculoskeletal problems of back area cause absence and reduction in activity levels of workers.²³ In another study in Canada, it has been shown that if the musculoskeletal disorders

are diagnosed timely, control measures can prevent chronicity of these problems.²⁹ On the other hand, such problems inflict hidden and overt psychological losses on work environment. Researchers believe that a collection of work environment risk factors like steady working, work pressure, high work load and poor worker-supervisor relationship are involved in development of musculoskeletal disorders.³⁰ In addition, some musculoskeletal disorders cause reduction in productivity of the work.⁷ while many financial losses like expenses of treatment, indemnity, absenteeism and lost work days and also expenses of retraining and replaced person and so on. In a study carried out in America during the years 1987 through 1995, it was shown that the number of complaints from musculoskeletal disorders was very high.² In another study carried out in the same country during the years 1990 through 1998, it was established that the number of complaints from disorders of neck, back and upper part of body by workers was very high and caused a great deal of expenses and lost workdays.⁵ Lipascaomb and colleagues also, in a cohort study lasting for 15 years, showed that expenses of compensation paid to workers for musculoskeletal disorders of back area from the year 1998 to 2003 exceeded 128 million Dollars, based on calculation of 0.97 Dollar per hour of work.⁶ According to NIOSH classification, musculoskeletal disorders take the second rank among health problems and complications caused from work.⁶ Investigations also have showed that back pain is the second major cause of disability in people over 45 years of age, after cardiovascular diseases. In this respect, NIOSH states that vertebral column injuries constitute 20 percent of the whole injuries and diseases of work environment allocating around 20 to 50 billion Dollars of expenses by itself. According to the statistics available in relation and occupational health indices of Environment and Work Health Center, Iranian Ministry of Health in 2009, 37% of working people in Iran had had poor body posture during work and 15% had been working and unsuitable tools. Therefore, with an approach of development of preventive programs^{29,31} in order to reduce problems and environmental stresses rooted in not observing ergonomic principles, control and preventive recommendations are required. Application of such recommendations can render the work environment more suitable for the assigned job and workers can work at ease and tranquility, which will result in increased final output; and finally, all these measures will end in reduced energy consumption for doing the job, reduced static activities and increased productivity at human dimensions.

Conclusion

In this study, it was established that prevalence of disorders of cervical area, shoulders and hands, vertebral column, back, knees, thigh and feet were higher in exposed group, which corresponds to the findings of Nak and

colleagues.¹⁹ Age, work records and gender were also effective in prevalence of musculoskeletal disorders.³² In addition, in work environment evaluated, unsuitable work posts including desks and chairs, were being used. Therefore, it is recommended that training programs concerning proper method of doing the jobs and sitting³³ be conducted and the work instructions and sewing machine stations including sitting surfaces and work desks be corrected in accordance with the latest ergonomic standards.³⁴ All these measures should be accompanied and suitable warm up exercises at the beginning and in between execution of the work. Furthermore, periodic screening examinations should be conducted at least once in a year for timely finding of inflicted workers and appointing lighter jobs or work rotation (work-rest system) in order to prevent imposing pressure upon workers.¹⁶ Furthermore, since investigations have shown that the pain in cervical and shoulder areas have considerable influence on not feeding healthy and poor performance of people after working age and elderly,³⁵ exploiting younger people in such works is important.

Acknowledgment

Hereby, sincere cooperation of the managers, employees and workers of Vien shoe manufacturing company in execution of this project is greatly appreciated.

References

1. Kilbom S, Armstrong T, Buckle P, Fine L, Hagberg M, Haring-Sweeney M, et al. Musculoskeletal disorders: Work related risk factors and prevention. *Int J Occup Environ Health* 1996; 2: 239-46.
2. Silverstein B, Welp E, Nelson N, Kalat J. Claims incidence of work-related disorders of the upper extremities: Washington state, 1987 through 1995. *Am J Public Health* 1998; 88: 1827-33.
3. Daniell WE, Fulton-Kehoe D, Franklin GM. Work-related carpal tunnel syndrome in Washington State workers' compensation: utilization of surgery and the duration of lost work. *Am J Ind Med* 2009; 52: 931-42.
4. Zakaria D. Rates of carpal tunnel syndrome, epicondylitis, and rotator cuff claims in Ontario workers during 1997. *Chronic Dis Can* 2004; 25: 32-9.
5. Silverstein B, Viikari-Juntura E, Kalat J. Use of a prevention index to identify industries at high risk for work-related musculoskeletal disorders of the neck, back, and upper extremity in Washington state, 1990-1998. *Am J Ind Med* 2002; 41: 149-69.
6. Lipscomb HJ, Dement JM, Silverstein B, Cameron W, Glazner JE. Compensation costs of work-related back disorders among union carpenters, Washington State 1989-2003. *Am J Ind Med* 2009; 52: 587-95.
7. Martimo KP, Shiri R, Miranda H, Ketola R, Varonen H, Viikari-Juntura E. Self-reported productivity loss among workers with upper extremity disorders. *Scand J Work Environ Health* 2009; 35: 301-8.
8. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. *Appl Ergon* 1987; 18: 233-7.
9. Gobba F, Ghersi R, Martinelli S, Richeldi A, Clerici P, Grazioli P. Italian translation and validation of the Nordic IRSST standardized questionnaire for the analysis of musculoskeletal symptoms. *Med Lav* 2008; 99: 424-43. [Article in Italian].
10. Palmer K, Smith G, Kellingray S, Cooper C. Repeatability and validity of an upper limb and neck discomfort questionnaire: the utility of the standardized Nordic questionnaire. *Occup Med (Lond)* 1999; 49: 171-5.
11. Akesson I, Johnsson B, Rylander L, Moritz U, Skerfving S. Musculoskeletal disorders among female dental personnel--clinical examination and a 5-year follow-up study of symptoms. *Int Arch Occup Environ Health* 1999; 72: 395-403.

12. Andersson K, Karlehagen S, Jonsson B. The importance of variations in questionnaire administration. *Appl Ergon* 1987; 18: 229-32.
 13. Newell TM, Kumar S. Prevalence of musculoskeletal disorders among orthodontists in Alberta. *International Journal of Industrial Ergonomics* 2004; 33: 99-107.
 14. Zejda JE, Bugajska J, Kowalska M, Krzych L, Mieszkowska M, Brozek G, et al. Upper extremities, neck and back symptoms in office employees working at computer stations. *Med Pr* 2009; 60: 359-67. [Article in Polish].
 15. Arvidsson I, Axmon A, Skerfving S. Follow-up study of musculoskeletal disorders 20 months after the introduction of a mouse-based computer system. *Scand J Work Environ Health* 2008; 34: 374-80.
 16. Bracci M, Croce N, Baldassari M, Amati M, Monaco F, Santarelli L. Low back pain in VDT operators: importance of sports activities. *G Ital Med Lav Ergon* 2007; 29(3 Suppl): 563-4.
 17. Ostergren PO, Hanson BS, Balogh I, Ektor-Andersen J, Isacson A, Orbaek P, et al. Incidence of shoulder and neck pain in a working population: effect modification between mechanical and psychosocial exposures at work? Results from a one year follow up of the Malmö shoulder and neck study cohort. *J Epidemiol Community Health* 2005; 59: 721-8.
 18. Messing K, Stock SR, Tissot F. Should studies of risk factors for musculoskeletal disorders be stratified by gender? Lessons from the 1998 Québec Health and Social Survey. *Scand J Work Environ Health* 2009; 35: 96-112.
 19. Nag A, Vyas H, Nag PK. Gender differences, work stressors and musculoskeletal disorders in weaving industries. *Ind Health* 2010; 48: 339-48.
 20. Gummesson C, Isacson SO, Isacson AH, Andersson HI, Ektor-Andersen J, Ostergren PO, et al. The transition of reported pain in different body regions - a one-year follow-up study. *BMC Musculoskelet Disord* 2006; 7: 17.
 21. Hooftman WE, van der Beek AJ, Bongers PM, van Mechelen W. Is there a gender difference in the effect of work-related physical and psychosocial risk factors on musculoskeletal symptoms and related sickness absence? *Scand J Work Environ Health* 2009; 35: 85-95.
 22. Cole DC, Ibrahim SA, Shannon HS, Scott F, Eyles J. Work correlates of back problems and activity restriction due to musculoskeletal disorders in the Canadian national population health survey (NPHS) 1994-5 data. *Occup Environ Med* 2001; 58: 728-34.
 23. Hellsing AL, Bryngelsson IL. Predictors of musculoskeletal pain in men: A twenty-year follow-up from examination at enlistment. *Spine (Phila Pa 1976)* 2000; 25: 3080-6.
 24. Banerjee P, Gangopadhyay S. A study on the prevalence of upper extremity repetitive strain injuries among the handloom weavers of West Bengal. *J Hum Ergol (Tokyo)* 2003; 32: 17-22.
 25. Wang PC, Rempel DM, Hurwitz EL, Harrison RJ, Janowitz I, Ritz BR. Self-reported pain and physical signs for musculoskeletal disorders in the upper body region among Los Angeles garment workers. *Work* 2009; 34: 79-87.
 26. King P, Huddleston W, Darragh AR. Work-related musculoskeletal disorders and injuries: differences among older and younger occupational and physical therapists. *J Occup Rehabil* 2009; 19: 274-83.
 27. Lei L, Dempsey PG, Xu JG, Ge LN, Liang YX. Risk factors for the prevalence of musculoskeletal disorders among chinese foundry workers. *International Journal of Industrial Ergonomics* 2005; 35: 197-204.
 28. Choobineh A, Tabatabaei SH, Mokhtarzadeh A, Salehi M. Musculoskeletal problems among workers of an Iranian rubber factory. *J Occup Health* 2007; 49: 418-23.
 29. Deakin JM, Stevenson JM, Vail GR, Nelson JM. The use of the Nordic questionnaire in an industrial setting: a case study. *Appl Ergon* 1994; 25: 182-5.
 30. Hales TR, Bernard BP. Epidemiology of work-related musculoskeletal disorders. *Orthop Clin North Am* 1996; 27: 679-709.
 31. Roquelaure Y, Ha C, Leclerc A, Touranchet A, Sauteron M, Melchior M, et al. Epidemiologic surveillance of upper-extremity musculoskeletal disorders in the working population. *Arthritis Rheum* 2006; 55: 765-78.
 32. Ghaffari M, Alipour A, Jensen I, Farshad AA, Vingard E. Low back pain among Iranian industrial workers. *Occup Med (Lond)* 2006; 56: 455-60.
 33. Lemasters GK, Atterbury MR, Booth-Jones AD, Bhattacharya A, Ollila-Glenn N, Forrester C, et al. Prevalence of work related musculoskeletal disorders in active union carpenters. *Occup Environ Med* 1998; 55: 421-7.
 34. Choobineh A, Hosseini M, Lahmi M, Khani Jazani R, Shahnava H. Musculoskeletal problems in Iranian hand-woven carpet industry: guidelines for workstation design. *Appl Ergon* 2007; 38: 617-24.
 35. Vogt MT, Simonsick EM, Harris TB, Nevitt MC, Kang JD, Rubin SM, et al. Neck and shoulder pain in 70- to 79-year-old men and women: findings from the Health, Aging and Body Composition Study. *Spine J* 2003; 3: 435-41.
-