

Effect of physical activity on musculoskeletal discomforts among handicraft workers

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ABSTRACT

Introduction: Handicrafts seems to be one of the high-risk jobs regarding work-related musculoskeletal disorders (WMSDs) which necessitate the implementation of different corrective intervention like regular physical activities. This study aimed to investigate the impact of physical activity on WMSDs among craftsmen. **Methods:** This cross-sectional study was an analytical – descriptive study carried out on 100 craftsmen working in Isfahan, Iran, in 2013. The sampling method was census, and all workshops involved with this job were included. Information on demographic parameters and physical activity was collected by demographic forms. The data related to worker's musculoskeletal discomforts were conducted using Cornell Musculoskeletal Discomfort Questionnaire. The data were analyzed using statistical tests including independent *t*-test, Chi-square, and ANOVA. The statistical analysis was performed using SPSS 18. **Results:** The highest percentages of complaints related to severe musculoskeletal discomfort were reported in right shoulder (%36), right wrist (%26), neck (%25), and upper right arm (%24), respectively. A significant relationship was observed between physical activity and musculoskeletal discomforts of left wrist ($P = 0.012$), lower back ($P = 0.016$), and neck ($P = 0.006$). **Discussion and Conclusion:** Based on the study results, it can be inferred that regular but not too heavy physical activity can have a positive impact on decreasing the musculoskeletal discomforts.

Key words: Cornell questionnaire, handicrafts, musculoskeletal discomforts, physical activity

INTRODUCTION

Musculoskeletal discomforts are based on self-reported expressions.^[1] These discomforts are of the most common health problems leading to the pain and unfavorable feeling among workers in the workplaces.^[2-4]

According to the previous studies, unlike increasingly expansion of mechanical and automatic processes, the

work-related musculoskeletal disorders (WMSDs) are still the main reason of losing working time, increasing costs, and disabling workforce in industrialized countries. Moreover, WMSDs are considered as the most important predicament to be involved with for ergonomists all over the world.^[5,6]

It is estimated that nearly %45 of all absences related to occupational diseases in Norway refers to WMSDs.^[7]

Despite a plenty of information and knowledge related to WMSDs as well as psychosocial and physical risk factors

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This article may be cited as: Shakerian M, Rismanchian M, Khalili P, Torki A. Effect of physical activity on musculoskeletal discomforts among handicraft workers. *J Edu Health Promot* 2016;5:8.

Access this article online	
Quick Response Code:	Website: www.jehp.net
	DOI: 10.4103/2277-9531.184546

inducing musculoskeletal discomforts, little is known about the effect of physical activity as a preventative factor on incidence or aggravating WMSDs.^[8,9]

The definition of physical activity has been varied between many researchers and has induced a high degree of differentiation between measurable units.^[10] However, according to recent studies, light physical activity is likely to be an inseparable part of life and includes all individuals' activities including job, daily life, and leisure time.^[11]

Regarding the previous studies, physical activity is mostly considered as a preventative factor against many kinds of disease including WMSDs.^[12] Review studies on dose-response relationship between physical activity and health have revealed that several health factors are likely to be associated with the amount of graded physical activity.^[13-15]

Nevertheless, the positive effect of physical activity on preventing WMSDs has not been approved yet and researches studying on physical activity are mostly restricted to studies on physical activity during leisure time and at work. In a review study carried out in 2003 on physical activity in the workplace, positive effects of leisurely physical activity on WMSDs had been found.^[16] However, in some studies including the study carried out by Cagnie *et al.* in 2007 on the relationship between leisure physical activity and WMSDs, inconsistent findings were concluded.^[17]

Vuori *et al.* in 2005, assigned no evidence for the impact of physical activity through leisure time on low back pain,^[18] however, in another study performed by Vuori physical activity during leisure time showed a positive effect on low back pain prevention.^[19]

Regular exercise activities seem to have a preventive role on affecting neck and shoulder discomforts.^[20] Nevertheless, physical training and exercise activities are sometimes origins of musculoskeletal disorders.^[21]

On the other hand, many musculoskeletal injuries with an origin of a sport activity of a person might be included among self-reported WMSDs.^[22]

The previous studies have revealed unfavorable effects of WMSDs on productivity and health all over the world. For instance, statistical studies in the United States in 2006 illustrated that nearly %30 of missed working days were related to WMSDs.^[23] A wide variety of evidences indicates that prevention and reduction of WMSDs are considered as important priorities in the world.^[24]

Handicraft is one of the industries in which a major part of the workforce is still contained with high prevalence of WMSDs complaints.^[25] Handicrafts are simply defined as those activities through which some products are manufactured by hand with certain skills and individual creation as well as enough experience is considered as a prerequisite for most of

them. Handicraft is mostly carried out individually in small and often in home workshops that are still including a large number of workforces, requires particular attention of those organizations responsible for health care services.

In a study conducted by Motamedzade *et al.*, on hand tools used in carpet weaving it was concluded that the hand tools were not ergonomically matched with weaver's body. It was also found that the weaving hand tools imposed tension on the soft tissues and nerves of the weavers' palms.^[26]

In another study performed by Byström *et al.* on craftsmen working with pottery to make a sculpture, it was aimed to decrease muscle fatigue and discomfort feeling. In this study, self-reported symptoms revealed considerable amount of discomfort in right shoulder and low back muscles.^[27] Meena *et al.* studied 20 people working as a trainer in one of the handicrafts industry and asked them some questions related to WMSDs. It was found in his study that the prevalence of musculoskeletal problems in the shoulder, low back, and knees are higher than other areas of their body.^[28]

Based on the observations of research group, handicraft tasks impose awkward postures to workers as well as repetitive movement. These jobs, therefore, can highly contain musculoskeletal risk factors. A number of studies on different aspects related to WMSDs is not few; however, the lack of information in the handicraft industry still seems as a predicament in Iran. On the other hand, the hypothesis of favorable role of physical activity in decreasing WMSDs symptoms should be studied and in this way, implementation of regular physical activities in this high-risk group can be regarded as a solution. The present study, therefore, carried out with the purpose of evaluation of physical activity effects on self-reported musculoskeletal discomforts among the workers of target industry.

METHODS

The present study was carried out on handicraftsmen working in Isfahan, Iran, in 2013. The applied sampling method was census, and all workshops involved in this industry such as home workshops were included.

The population under study was 100 working men who had at least 1 year working experience and were working in 4-5 individual groups totally in 25 workshops.

In order to obtain more precise results, the process was required to be observed in order to ensure the presence of some repetitive motion in the task as well as awkward postures. The research team, therefore, attended in each workshop and monitored the chintz-making process directly while recording the repetitive movements to enable analyzing the tasks precisely. After interviewing with the participants, the demographic characteristics information was collected as well as the physical activity type and the allocated time (hour per week) doing exercise by the subjects for those with sports activity report.

The data collecting tools included:

- a. Demographic and individual characteristics form: Some required data such as gender, weight, height, marital status, working unit, education, years of working experience, average daily working hours, average sports doing (hours per week), and exercise type (favorite professional sport) were asked from the subjects.
- b. Cornell Musculoskeletal Discomfort Questionnaire (CMDQ): CMDQ is an appropriate tool for collecting the information related to musculoskeletal discomfort that uses a body map to evaluate the discomfort frequency, intensity and its effect on individuals' working ability during the last week, twenty areas of the body is included to be analyzed in the body map.

Cornell Musculoskeletal Discomfort Questionnaire was developed to precisely evaluate individual's self-reported musculoskeletal discomfort. This questionnaire consists of three main parts including the first part relating to experiencing discomfort or pain during the last working week that is scored in 5 status from never to several times every day, the second part related to the severity of the pain or discomfort, if exists, in 3 status from slightly uncomfortable to very uncomfortable and the third part related to the interference of the possible discomfort or pain on the workers ability to work in 3 status from not at all to substantially interfered. The validity and reliability of CMDQ were investigated in Iran by Afifehzadeh-Kashani *et al.* in 2011 and Cultural adjustment of the questionnaire also had been implemented.^[29]

The study was approved by the ethics committee for human research at the Medical University of Isfahan. Finally, the data were analyzed using Chi-square, independent *t*-test, and ANOVA test. The SPSS V18 [SPSS Inc: Chicago.] was used to analyze the data.

RESULTS

Considering the collected data, the mean age was 33.16 ± 10.64 years and in a range of 16–58 years among craftsmen under study. Other demographic characteristics of the participants are presented in Table 1.

According to an interview with the craftsmen on sports doing and physical activity, %47 claimed that they had physical activity in their weekly program. Moreover, the most popular sports among the craftsmen were wrestling, soccer, swimming, and walking, respectively.

Based on the purposes of the study, the information extracted from Cornell questionnaires was analyzed. As it is presented in Table 2, according to the number of reported musculoskeletal discomforts among the subject, the highest complain percentage referred to right shoulder (%36), right wrist (%26), neck (%25), and upper right arm (%24), respectively. Moreover, %45 of the participants asserted that the ability of their work had been highly decreased as

their right shoulder had been painful. After right shoulder, the highest complaints on work ability reduction caused by musculoskeletal discomforts were found in right wrist (%34), neck (%25), upper right arm (%24), and lower back (%24). The results extracted from Cornell questionnaires including

Table 1: Demographic features of chintz-making workers (n = 100)

Demographic characters	Status	Number (%) n = 100
Marital status	Single	33 (33)
	Married	67 (67)
Level of education	Illiterate	5 (5)
	Primary school	28 (28)
	Before diploma	33 (33)
	Diploma	31 (31)
BMI	BA or more	3 (3)
	≤18	6 (6)
	18-25	58 (58)
	25-30	29 (29)
	35-30	7 (7)
	≥35	0

BMI=Body mass index

Table 2: Self-report musculoskeletal discomforts among chintz-making workers based on CMDQ (n = 100)

Musculoskeletal area	Experiencing ache, pain or discomfort (n = 100) (%)			The impact of pain, ache, or discomfort on working ability (n = 100) (%)			
	Low	Moderate	High	Low	Moderate	High	
Neck	11	30	25	3	38	25	
Shoulder							
	Right	7	33	36	3	28	45
	Left	3	14	5	3	11	8
Upper back	11	29	12	3	31	18	
Lower back	13	27	17	5	28	24	
Upper arm							
	Right	20	21	24	9	32	24
	Left	5	13	5	2	14	7
Forearm							
	Right	7	20	18	5	18	23
	Left	8	8	1	4	11	2
Wrist							
	Right	15	22	26	4	25	34
	Left	6	4	1	2	7	2
Hip/buttock	17	19	5	8	25	8	
Thigh							
	Right	9	18	6	2	18	13
	Left	8	12	3	2	13	8
Knee							
	Right	14	18	14	8	21	17
	Left	8	12	12	7	13	12
Lower leg							
	Right	10	17	6	2	22	9
	Left	8	12	1	2	15	4

CMDQ=Cornell Musculoskeletal Discomfort Questionnaire

the number of records on both musculoskeletal discomfort claims and their effects on the participants' working ability are shown in Table 2.

Table 3 represents the findings related to the effect of exercise activity on musculoskeletal discomfort by the craftsmen. As it can be inferred from the table, there is no significant relationship between the right shoulder discomfort and sport doing ($P = 0.52$, $\chi^2 = 3.18$).there was also no significant relationship between the right wrist ($P = 0.052$, $\chi^2 = 5.80$), upper right arm ($P = 0.08$, $\chi^2 = 8.18$), and sports doing. On the other hand, the current study finding illustrated a significant relationship between reported feeling discomfort in left forearm ($P = 0.002$, $\chi^2 = 17.00$), left wrist ($P = 0.012$, $\chi^2 = 12.83$), lower back ($P = 0.016$, $\chi^2 = 12.16$), neck ($P = 0.006$, $\chi^2 = 14.16$), and exercise activity. There was no significant relationship between feeling discomfort in other areas found by the subjects and sports activity.

DISCUSSION

The present study indicated a relationship between higher physical activity and less reported musculoskeletal discomforts. Based on the study results, the most reported musculoskeletal discomforts by target workers referred to right shoulder, right wrist, neck, and upper right arm, respectively. Considering the process of chintz-making and the fact that nearly %98 of participants were working with their right hand, achieving

Table 3: The relationship between physical activity and musculoskeletal discomforts among the participants

Musculoskeletal areas	Chi-square	P
Neck	14.468	0.006
Shoulder		
Right	3.185	0.527
Left	4.603	0.331
Upper back	2.641	0.620
Lower back	12.165	0.016
Upper arm		
Right	8.112	0.088
Left	3.794	0.435
Forearm		
Right	7.580	0.108
Left	17.00	0.002
Wrist		
Right	5.808	0.214
Left	12.833	0.012
Hip/buttocks	4.016	0.404
Thigh		
Right	2.750	0.600
Left	1.677	0.795
Knee		
Right	4.316	0.365
Left	6.205	0.184
Lower leg		
Right	1.517	0.824

such a results could be expected. These findings are parallel to the results of Palmer's study in which feeling pain in more involved areas was more reported.^[30] Moreover, based on the observations done by research team either directly or through camera recordings, the chintz-making process requires subjects to use patterned wooden stamp repeatedly so that the number of hand strokes on the blocks to be printed on the fabric may reach 25 beats/min. Hence, the higher percentage of self-reported complaints related to the right shoulder severe pain could not be unexpected. It is noteworthy that based on the measurements done by research team. The stamps weight was in a range of 200–1200 g for the lightest and the heaviest block, respectively. Furthermore, being precisely observed by the researchers, the craftsmen's postures were found to be frequently twisted mainly toward right side (involved hand), where the special surface full of painting was located, making contact the painting, the wooden block surface would be full of painting color to be used in chintz-making. The tension imposed on right shoulder joint of the craftsmen, therefore, would be more than that of other areas the body. The present study results are confirmed to the previous studies regarding the unfavorable impact of awkward postures and repetitive tasks on WMSDs.^[23] The complaints on the right wrist, neck, and upper right arm also displayed higher percentages of severe pain reports that is probably referring to the repetitive nature of this job through which the stamps are stroke while printing the designs on the fabric mostly by right hand [Figure 1]. The reason of high percentages of neck discomfort among target population could also be their permanently sitting posture while working that may lead to more serious problems if the corrective interventions would not be implemented.^[24]

As it was mentioned in the results, %45 of the craftsmen claimed that right shoulder pain has highly affected their work ability in a negative way. The findings on feeling disability while working caused by WMSDs agreed with the study carried out by Motamedzade *et al.*^[26]

However, based on the results, the relationship between physical activity and the right shoulder discomfort was not statistically significant ($P = 0.52$). Regarding the high percentage of right shoulder discomfort among all participants, this paradox can be a strong evidence for the

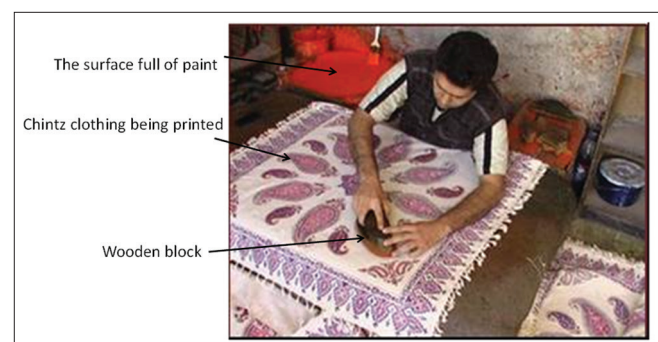


Figure 1: Chintz-making printing process

favorable effect of physical activity and exercise on decreasing working-induced musculoskeletal discomforts. These paradoxes also have been revealed for some other areas such as the right wrist ($P = \%8$). In other words, those individuals attending regular physical activity in their leisure time, experience less work-related musculoskeletal discomforts. Moreover, no significant relationship was found between the high prevalence of reported discomfort areas among total population (right shoulder, right wrist, and upper right arm) and physical activity which can support the positive effect of physical activity on prevention of WMSDs. These findings are parallel with the previous studies including a study performed on the workers of the aluminum industry in Norway in which a significant relationship was found between higher physical activity and less reported WMSDs. Interestingly, in the mentioned study, either heavy or light physical activity could display the same results.^[7] On the other hand, in some studies only light physical activity could have a positive role in reducing WMSDs.^[20] Thus, to achieve more precise results on possible effects of physical activity regarding the level of its intensity, more studies are required. Moreover, according to the current study findings, the correlation has been observed between the physical activity and musculoskeletal discomforts reported for the left forearm ($P = 0.002$) neck ($P = 0.006$), left wrist ($P = 0.012$) and lower back ($P = 0.016$). These results on feeling musculoskeletal discomforts among craftsmen involved in sport could be questionable. On the other hand, considering the interviews and the information extracted from the demographic forms, a large number of individuals involved in physical activity, are engaged in wrestling for at least 4 h a week, as the most popular local sports there. Hence, the higher prevalence of musculoskeletal discomforts in the left forearm, left wrist, neck, and lower back could be due to being mostly involved in wrestling. According to other studies, the highly affected areas in wrestling are upper limbs as well as lower back. Hence, the presence of higher musculoskeletal discomforts among craftsmen could be answered. Jasek's study in 2012 also found similar results.^[31]

Furthermore, a plenty of studies have revealed musculoskeletal injuries in some parts of the athletes' body.^[31,32] In addition, in a review study, the amount of musculoskeletal disorders in some parts of the body showed an increasing trend with making physical activity heavier and longer.^[33]

However, the present study had some restrictions. First of all, our study was carried out in one of the villages located in Isfahan province and despite applying census sampling method, the number of participants seems not sufficient to generalize results to the entire community. To get more precise results, therefore, a greater sample size is required. On the other hand, the information associated with physical activity was gathered based on demographic forms filled in by the participants. The presence of some confounding factors such as different subjective interpretations of the people, as most of the other studies with subjective self-reported data, was naturally not far-fetched. Designing some case-control

studies among both athletes and nonathletes, therefore, may result in more precise findings. Moreover, considering the high prevalence of musculoskeletal discomforts among craftsmen in chintz-making industry as well as less working ability, it could be inferred that repetitive motions with high frequency in each minute requires several planned corrective actions. Implementing some possible solutions including increasing the number of workers, decreasing working time, rearranging the required equipment such as different stamp blocks and setting an appropriate educational program for these people to have a regular light physical activity during their works are recommended.

CONCLUSION

Based on extracted results, there is probably a relationship between less reported discomfort feeling and its effect on their work ability, particularly in fabric printing process where involved musculoskeletal parts are affected, by handicrafts workers and doing regular physical activity. Here, it can be inferred that handicrafts workers are possible to endanger of musculoskeletal problems if ergonomics interventions including regular exercises and corrective actions would not be considered.

Acknowledgments

This study was financially supported by the Research Center of Medical University of Isfahan No. 292045. The authors also gratefully acknowledge all people helped in this study to be performed especially Mrs. Katayoon Bagheri, the head of Occupational Health Center in Isfahan province.

Financial support and sponsorship

This study was financially supported by the Research Center of Medical University of Isfahan No. 292045.

Conflicts of interest

There are no conflicts of interest.

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