Prevalence of Musculoskeletal Symptoms in Taiwan's Traditional Industries

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Abstract

The purpose of this study was to analyze the prevalence of self-reported musculoskeletal symptoms among the three Taiwan's traditional industries as lathe, electronics and food by the Nordic Musculoskeletal Questionnaire (NMQ). Moreover, the study was also to make a comparison among the aforesaid industries for revealing their differences. The result of the questionnaire indicated that the symptoms appeared on the three industries were all originated from four parts as neck, shoulders, elbows, and wrists/hands. More than 68% of the interviewers thought that their symptoms might be related to their work. However, the rate of harmful influence resulted from life or job was over 50%. As to the respect of the interviewers' attitude in treating their symptoms, more than 80% of them neglected or just treated the symptoms by massaging or cold/hot compressing and resting. From the questionnaire, the proportion of symptoms discussed in each item indicated that the distribution, in perceiving symptom, of interviewers were not quite identical; however the Chi-square test discovered majority did not reach 0.05 levels, hence the difference among industries were not significant.

Key Words: NMQ, Musculoskeletal symptoms, Traditional industries

1. Introduction

Workers in Taiwan's traditional industries are commonly exposed to poor work environments as compared to those in high-tech industries. Despite the depressed economy and difficulty in finding employment recently, the number of people willing to work in these

industries continued to decrease. Some factories are unable to hire workers despite the present high unemployment rate. Bad work environments easily cause occupational injuries, such as hearing, eyesight, and musculoskeletal injuries. Statistics of Taiwan as well as highly industrialized nations, such as the US and Japan [2, 4, 6] revealed that, musculoskeletal disease occurrence frequency is very high. Major types of injuries are back, elbow, shoulder, and knee injuries (see Table 1). A material factor is the accumulated injuries resulting from long period of neglect in the work environment and human comfort. Aside from environmental factors, such injuries are related to the wrong habits and poor working postures of the workers.

Table 1. Causes of Occupational Diseases in the Occupational Diseases Cases

Occupational disease factor	Symptoms	(%)
Lower back pain	64	42.4
Other occupation-caused diseases	44	29.1
Arm, neck, shoulder illnesses	7	4.6
Organic solvent or chemical gas	6	4
Occupational asthma, allergic pneumonia	5	3.3
Silicosis and complications	3	2
Abnormal air pressure	2	1.3
Noise-induced hearing loss	1	0.7
Total	151	100

Highly repetitive work is very common in traditional manufacturing industries; hence recurring injuries are suffered in each industry. Table 2 showed that the ten top occupational injuries are found in traditional industries; hence, the improvement of such work environments is evidently more important. This paper conducted a repetitive trauma disorders study on the following three traditional industries to compare and analyze the various recurring injuries and the frequency of workers: metal manufacturing (cases of workers operating lathes in factories), electronics and food products. Moreover, the paper also proposed specific suggestions for the treatment of said recurring musculoskeletal injury symptoms.

2. Research Methodology

Questionnaire is a commonly used tool for understanding the prevalence of musculoskeletal symptoms of workers; findings may be used as reference for the solution of worker injuries. Our questionnaire design is patterned after the standardized Nordic Musculoskeletal Questionnaire (NMQ), musculoskeletal symptoms and injuries common to workers in workplaces are surveyed through a standardized questionnaire design for a distinctive definition of existing problems, as well as for a comparative study of the findings of different work analysis methods.

Table 2. Ten Top Occupational Injuries [3]

	Occupational Injury Sufferers	**Occupational Injury Rate (1/1000)**
Coal mining	55	0.1303
Wood processing and manufacturing	1090	0.0149
Furniture and decoration manufacturing	797	0.0143
Non-metal mining	21	0.0142
Metal product manufacturing	4706	0.0135
Basic metal industry	811	0.0134
Other construction	769	0.0126
Machinery & equipment manufacturing, repair, and installation	2185	0.0115
Vehicle manufacturing, repair, and installation	1312	0.0103
Rubber product manufacturing	373	0.0094

The NMQ is sensitive in identifying the symptom differences found in varying working stations. The NMQ may be created as a general questionnaire or a specific questionnaire [5, 7]. Usually, the general questionnaire understands whether individuals have experienced the inconveniences, while the specific questionnaire conducts an in depth survey on the specific symptoms (time of occurrence, duration, type of symptom, effects on life, frequency, treatment methods, and work relativity). The NMQ divided the human body into the following nine major parts: neck, shoulders, upper backs, lower backs, elbows, hands/wrists, hips/thighs, knees and ankles/feet. One hundred and twenty five questionnaires were distributed to the metal manufacturing (specifically to the iron factory lathe operators), electronics, and food products industries on a random sampling basis. Findings were placed

under EXCEL and SPSS statistics software for statistical and variance analysis. We conducted a frequency distribution statistics on the questionnaire contents then evaluated whether a significant difference existed in the findings of the three industries; significance difference, if any, found were placed under the General Loglinear Analysis for a Chi-square test's posterior comparison ($\alpha = 0.05$) to determine the variant industry groups.

3. Result Analysis

3.1 Samples

The paper surveyed 125 respondents working in the three traditional industries from January 2004 to February 2004; specifically 50 lathe operators, 40 electronics industry workers, and 35 food industry workers. Verbal interviews were conducted on the workplaces hence a precise count of the recovery rate could not be obtained. Basic data obtained are shown in Table 3:

Table 3. The basic data of subjects

Average	Lathe (n = 50)	Electronics (n = 40)	Food (n = 35)
Height	163.75 (7.56)	167.46 (7.74)	165.21 (8.82)
Weight	55.52 (10.71)	60.81 (9.17)	54.81 (9.13)
Age	30.72 (5.17)	24.98 (6.5)	24.12 (6.94)

Note: data in parenthesis indicate standard deviation.

3.2 Symptom distribution status

The following show the analytical study of the specific questionnaire.

3.2.1 Types of Symptoms

The musculoskeletal system injury symptoms are classified into the following: "ache", "swelling", "numbness", "stinging pain", "waking up by pain", "muscular dystrophy" and "others". For symptom location, please refer to the following:

Thirty-six (or 72%) of the 50 lathe operator respondents experienced the symptoms and the most common musculoskeletal injury experienced is "ache", "ache" cases amounted to 51.72%, mostly located in the shoulder and wrists (9%~11%), followed by "numbness" (17.93%) and "stinging pain" (11.03%). "Other" symptoms were below 10% but the more

serious symptom like "waking up by pain" amounted to 9.66%, a very high ratio deserving serious attention. In the electronics industry respondents group, 67.5% admitted experiencing symptoms in their body parts, of which "ache" had the highest ratio, 78.26%. Locations of the "ache" were mostly in the shoulders and elbows, 14.78% and 12.17%, respectively. As for the other symptoms "stinging pain" and "numbness" had the highest ratios, above 5%. The "waking up by pain" and "muscular dystrophy" ratios were apparently a lot less than among lathe operators.

In the food industry respondents group, 62.86% admitted experiencing symptoms in their body parts, "ache" still had the highest ratio, 74.58%. Locations of the "ache" were mostly in the shoulders and neck (over 20%), hands/wrists (9.32%), then elbows and knees (8.47%). As for the other symptoms, "numbness" amounted to 11.86%, the rest were below10%. Ratios of the more serious symptoms like "waking up by pain" and "muscular dystrophy" were below 1%. The musculoskeletal injury symptoms experienced in the three industries exceeded 60%, and "ache" had the highest ratio. As for symptom location, the highest ratios were located in the neck, shoulders, hands/wrists, and elbows. As shown in Table 4, after running the Chi-square test, it was found that a significant difference (χ^2 = 6.82, p= 0.033) in the "hands/wrists" ratio was noted in the three industry data, the posterior comparison revealed that ratio of lathe operators suffering "waking up by pain" is higher than in the other two industries. It was probably due to the heavier weight of the tolls used in their work condition deserves more attention.

3.2.2 Treatment attitude

The treatment attitude of the workers are classified into nine options: "ignore", "underwent surgery", "underwent rehabilitation", "massage", "hot compress", "cold compress", "take medication", "apply external medicine", and "others".

Table 4. Frequency Distribution Variance Analysis of Symptoms (Unit: %)

	Neck	Shoulders	Upper Back	Low Back	Elbows	Wrists/ hands	Hips/ thighs	Knees	Ankles/ feet
χ^2	0.02	2.98	2.85	1.96	5.22	6.82*	4.28	1.46	3.20
P-value	0.988	0.226	0.240	0.375	0.073	0.033	0.118	0.482	0.202
Variant						L-E L-F			

Note: 1. A significant difference was noted in the Chi-square test ($\chi^2_{2,0.05}$ = 5.99) results of the body part symptom frequency distribution of the three industry respondents; the "*" mark identify the Chi square values.

2. "Variant" marks industries with variances after the Chi square posterior comparison. "L" marks the lathe, "E" marks the electronics, and "F" marks the food products.

Attitude majority of the symptom suffering lathe operators took was "ignore", around 40.85%; symptom locations with the highest ratio were the shoulders and hands/wrists parts. 30.28% used "massage". A very high ratio 88.03% of workers experiencing musculoskeletal symptoms did not seek proper medical attention (including "ignore", "massage", and "hot or cold compress"); ratio of those who did was below 5%. In the electronics industry, most of the respondents also adapted the "ignore" and "massage" attitudes, 38.98% and 34.75% respectively; hence untreated cases had a high ratio of 81.36%. However, respondents who were willing to obtain medical attention and take medicines or rehabilitation were higher than 5%. In the food industry, the most popular respondent attitudes were "ignore" and "massage" as well, the two took up 82.62%; the highest ratio was from shoulders symptom sufferers. Untreated cases amounted to 91.87% of respondents; ratio of those who sought medical treatment was below 5%.

Surprisingly, over 80% of the workers from the three traditional industries who acquired musculoskeletal symptoms did not have proper medical treatment; most of these workers opted to "ignore" or "massage" conditions; the highest ratio came from the food industry. It is apparent that the workers in these industries believed that "getting more rest will make them better" or resorted to ethnic treatments (massage, cold or hot compress). Table 5 showed a significant difference in the hands/wrists symptoms data of the three industries (χ^2 = 12.69, p = 0.013), although a small ratio sought proper medical treatment, but the ratio of electronics industry respondents who chose to ignore musculoskeletal symptom was lower compared to the ratio of the other two industries.

Table 5. Variance Analysis of Treatment Attitudes (Unit: %)

	Neck	Shoulders	Upper Back	Low Back	Elbows	Wrists/ hands	Hips/ thighs	Knees	Ankles/ feet
χ^2	2.02	11.34*	5.90	2.58	4.73	12.69*	5.62	5.63	3.71
P-value	0.732	0.023	0.206	0.630	0.316	0.013	0.229	0.228	0.447
Variant						E-L E-F			

Note: 1. A significant difference was noted in the Chi square test ($\chi^2_{4,0.05}$ = 9.49) results of the body part symptom frequency distribution of the three industry respondents; the "*" mark identify the Chi square values.

2. "Variant" marks industries with variances after the Chi square posterior comparison. "L" marks the lathe, "E" marks the electronics, and "F" marks the food products.

3.2.3 Effects on work and life

In aspect of the effect of musculoskeletal symptoms on the life and work of the respondents, self-awareness reaction on the effects of the symptoms were classified into seven conditions: "no effect whatsoever on work and life", "slightly reduced work skills", "significantly reduced work skills", "took symptom related sick leaves", "affected life", "totally incapable of moving", and "others". Industry-based analysis is as shown in the following:

Among the lathe operator respondents who suffered musculoskeletal injury, only 20.83% felt symptoms had no effect whatsoever on life or work; in other words a total 79.17% felt a negative effect on their lives and work. The highest percentage belonged to "slightly reduced work skills" (42.36%), followed by "significantly reduced work skills" (22.22%), the rest of the negative effects were below 10%. In the electronics industry respondent group, ratio of "no effect whatsoever on work and life" reaction was 47.33% (percentage of negative influence on work and life took up 52.67%), respondents who felt "slightly reduced work skills" amounted to 29.77% and 14.50% for "significantly reduced work skills". In the food products respondent group, 37.98% of the symptom-suffering respondents answered "no effect whatsoever on work and life, hence the negative effects on work and life was 62.02%; the highest number of cases belonged to "slightly reduced work skills" (45.74%). The foregoing analysis of the three industries revealed that majority of the respondents felt the negative effect on workers (above 60%); average percentage of those who felt symptoms would "slightly reduce worker work skills" was around 30%. The Chi-square test on the three industries (see Table 6) revealed that variance found among the nine body parts did not reach significant levels. Apparently, effects of the symptoms on workers were the same despite the difference in industry type.

Table 6. Variance Analysis of the Symptom Effects (Unit: %)

	Neck	Shoulders	Upper Back	Low Back	Elbows	Wrists/ hands	Hips/ thighs	Knees	Ankles/ feet
χ^2	7.61	5.52	8.79	3.32	7.30	4.13	7.08	6.28	5.68
P-value	0.107	0.238	0.067	0.506	0.121	0.389	0.132	0.181	0.224

Note: A significant difference was noted in the Chi-square test ($\chi^2_{4,0.05} = 9.49$) results of the body part symptom frequency distribution of the three industry respondents.

3.2.4 Work Relativity

The NMQ classified the relativity of symptom occurrence with work into the following four factors: "totally work related", "partially work related", "not sure if work related", and "not work related". A bigger number of symptom-suffering lathe operators believed that symptom was "partially work-related" (45.52%); highest percentage came from shoulder symptom sufferers (11.03%). Respondents who felt symptom was "totally work-related" reached 28.97%; hence 74.49% of the symptoms were totally or partially work related. Those who believed symptom was "not work-related" was 4.82%. The symptom-suffering respondents in the electronics industry who believed symptoms were "partially work-related" had the highest ratio (48.18%); 24.55% of the respondents believed they were "totally work-related". Hence 72.73% of the cases were work-related in one way or the other; only 7.27% were sure they were work related.

Most of the symptom-suffering respondents in the food industry believed symptoms were "partially work-related" and had the highest percentage (46.77%). A higher percentage belonged to shoulders and hands/wrists symptom sufferers and respondents who believed that they were "totally work-related" (21.77%), hence a total of 68.54% believed symptoms were totally or partially work-related. Only 4.03% believed symptoms were "not work-related". Among the questions majority of the respondents believed symptoms were "partially work-related" (over 45%), these those who believed that symptoms were somewhat related to work reached 70%; less than 10% believed that symptoms were not work-related. Table 7 revealed that, after the Chi-square test, data of the nine body parts in the three industries did not reach significant levels, thereby showing that work relativity factor of symptoms did not vary due to industry type.

Table 7. Variance Analysis of Work Relativity (Unit: %)

	Neck	Shoulders	Upper Back	Low Back	Elbows	Wrists/ hands	Hips/ thighs	Knees	Ankles/ feet
χ^2	2.32	5.17	6.61	0.93	3.58	7.26	4.26	2.61	3.73
P-value	0.678	0.270	0.158	0.920	0.466	0.123	0.372	0.625	0.443

Note: A significant difference was noted in the Chi-square test ($\chi^2_{4,0.05} = 9.49$) results of the body part symptom frequency distribution of the three industry respondents.

4. Conclusion and Suggestions

The questionnaire survey on the traditional industry highly repetitive trauma disorders obtained an understanding of the actual symptom distribution status existing in the three industries (lathe, electronics, and food). The following conclusions were obtained from the questionnaire survey findings:

1. In the three industries, over 60% of the respondents admitted experiencing musculoskeletal injuries; 50% to 80% of which had muscular pains. A higher percentage of serious hand or wrist symptoms was noted in among lathe operators.
2. 65% to 82% of the symptom-suffering respondents had not sought medical attention, thus showing majority of the persons did not pay attention to these symptoms.
3. 60% to 80% of the symptom-suffering respondents believed that the symptoms affected their works or lives one way or another.
4. 70% of the respondents suffering musculoskeletal injuries believed that symptoms were totally or partially related to work; percentage of those who believed symptoms were not related to work was below 10%.
5. The Chi-square test showed a significant difference in the "symptom type" and "symptom treatment attitude" questions of hand or wrist symptom sufferers in the three industries. It is apparent that in the other aspects, differences among industries were not significant.

The present depressed economy and lower inclination of individuals to work in heavy manual labor put the development of traditional industries at a bottleneck condition; hence improvement of the work environment to prevent work-related injuries has taken greater importance. The study through the NMQ learnt that majority of the workers had musculoskeletal injuries; hence more attention should be paid on this matter. Regarding the improvement of working station conditions of workers, "work rotation" may be employed to reduce injuries from repetitive work. Not only would the procedure allow workers to have a better understanding of the company, but also reduce the occurrence of musculoskeletal injury due to long period of doing repetitive work. This is especially true among lathe operators, where a higher percentage of hand or wrist symptoms was noted compared to the other two industries. Work rotation or expansion as well as providing timely sufficient rest and break periods during work allow workers to rest and take a breather, thus gaining more spirit to work. Furthermore, generally, workers treated their symptoms through massage or hot/cold compress; otherwise they ignored it. The company should disseminate related information, preventive measures, and the right work posture to employees through education

and training to prevent symptoms from deteriorating.

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