

AN ERGONOMIC APPROACH TO AN INVESTIGATION INTO THE RISK FACTORS LEADING TO WORK-RELATED MUSCULOSKELETAL DISORDERS FOR TAIWANESE HAIRDRESSERS.

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ABSTRACT

Nowadays, interventions by ergonomists in the workforce have identified risk factors to prevent WMSDs among workers. However, the amount of data and research effort to indicate the problem among hairdressers has been limited. This study aims to investigate the risk factors of WMSDs for hairdressers by identifying the body regions associated with significant discomfort. Twelve professional Taiwanese hairdressers were invited to join this pilot study in Taiwan using a hairdresser-oriented musculoskeletal questionnaire to develop the study. The results from the study show that 91.7% of subjects reported shoulder discomfort as the most frequent problem followed by discomfort in the lower back (83.3%) and in the neck region (75%). Moreover, the study reveals that the effects of ageing could increase discomfort levels in the lower back and

lower leg. A further empirical investigation into detailed discomfort areas in relation to hairdressers' tasks and working postures may benefit the industry to prevent hairdressers from suffering WMSDs.

Keywords: Work-Related Musculoskeletal Disorders (WMSDs), Ergonomics, Hairdressers

1. INTRODUCTION

Work-related Musculoskeletal Disorders (WMSDs) in the hairdressing industry have increased significantly over recent years. There are ranges of different terminologies used to describe WMSDs problems such as Cumulative Trauma Disorders (CTDs), Repetitive Strain Injury (RSI), Repeated Motions Injury (RMI) and Occupational Overuse Disorders (OODs). This study focuses on how the hairdressing industry performs several different tasks in hair salons in a standing position. Since a hairdresser typically spends long working hours on various daily tasks, such as cutting, blow-drying, perming and washing hair, WMSDs are likely to be caused which impact on particular regions of their body. However, the amount of data and research effort to explore the problem among hairdressers has been limited. Therefore, this study aims to investigate the risk factors for WMSD within the hairdressing industry by identifying the body regions which exhibit significant discomfort. In order to do so, the following objectives need to be met:

- To review literature in the related areas;
- To design a hairdressers' oriented musculoskeletal questionnaire based on a Nordic Musculoskeletal Questionnaire;
- To survey twelve Taiwanese hairdressers by using designed an oriented musculoskeletal questionnaire;
- To identify the risk factors of WMSD problems of the body regions with significant discomfort among Taiwanese Hairdressers for further investigation.

2. RELATED WORKS

WMSDs have been a worldwide issue in many countries. In the U.K., the Health and Safety Executive (HSE, 2006) showed that Upper Limb Disorders are not confined to any one particular group of workers or industrial activity over recent years, but are widespread in the workforce. Hairdressers are amongst the groups which have reported high levels of arm pain. Furthermore, the HSE reports that WMSDs were the most common occupational illnesses, affecting 1.0 million people a year, with problems including lower back pain, joint injuries and repetitive strain injuries of various types. In Taiwan, the Institute of Health and Safety began developing a work injury prevention strategy and health and safety standards for the Government, employers and employees in 2002 (Lin, 2003). Moreover, a nationwide study indicated (Guo, 2004) that 37.0% of 18,942 people who returned a questionnaire had WMSDs. In the U.S., the Annual Survey of Occupational Injuries and Illnesses conducted by the Bureau of Labour Statistics (2001) reported that there were 522,528 WMSDs cases, with a total of 329,920 total employees from the service industries, resulting in absence from work. 1,582 of the cases involved hairdressers, hairstylists, and cosmetologists, and these included 575 cases involving the upper extremities and 245 cases in the lower extremities. In fact, MSD cases are increasing every year; however, there is no worldwide scheme of prevention against these conditions (Lin, 2003).

Amounts of data and research efforts to indicate the problem among hairdressers were limited. Amongst these, English et al (1995) studied five hundred and eighty cases and 996 controls; the diagnoses of the cases included soft tissue conditions affecting the shoulder, elbow, forearm, wrist, thumb, hand, and fingers; the controls included traumatic, degenerative, and inflammatory conditions, mostly of the legs and lower back, and found the risk highest for shoulders cases amongst female hairdressers. In 1988, an investigation reported through the National Health Interview Survey was analysed by Guo (2002), who pointed out that female Hairdressers and Cosmetologist are the third highest risk of the top 15 major occupations for lower back pain attributable to RA at work. Furthermore, Lin (2003) pointed out that WMSD cases claiming compensation from labour insurance between 1999 and 2001 showed the highest levels of compensation being granted to Taiwanese workers in the Hairdressing and Barber industry for upper limb disorders. One year later, Wu et al, conducted a questionnaire survey given to 36 hairdressers from thirteen hair salons as part of a study of the musculoskeletal disorders in employees working in beauty salons in Kaohsiung, Taiwan. As a result, Wu et al, revealed that most of the discomfort comes from the shoulders (94.4%), lower back (80.6%), and neck (77.8%). Moreover, a similar result from a quantitative study (n=360) by Chuang (2005), found that 94.4% of hairdressers voted that their shoulders were the most uncomfortable body region, followed by

the lower back and neck. In short, it is obvious that most research into WMSDs indicates that hairdressers suffer from discomfort in their upper limbs, neck, shoulders, lower back and wrists.

One of the common assessment methods used for investigating the prevalence of WMSDs in a particular occupational status is the Nordic Musculoskeletal Questionnaire (NMQ), presented by Kuorinka in 1987. The NMQ has been applied in various jobs to reveal their WMSDs problems, as the scales in the questionnaire are very reliable. Some current studies using the NMQ are discussed in the following: David and Buckle (1997) considered the ergonomic problems associated with the use of pipettes using the NMQ. This showed that the occurrence of elbow and hand complaints was significantly higher in the pipette-using population as compared to the control population. In 2001, Miranda et al used a modified version of the NMQ to evaluate the effects of work-related and individual factors as well as physical activities and sports on the incidence and persistence of shoulder pain among forestry workers in Finland. They found that the physical work with a heavy load, awkward work postures, mental stress and obesity were the risk factors. In 2003, Chen et al. investigated the discomfort associated with WMSD and occupational injuries within the foodservice industry in Taiwan. Chen et al. also highlighted that the shoulder, hand/wrist and low back had the highest discomfort levels, based on the five-point scale using the NMQ, where a higher score indicated more severe pain and tingle. Moreover, Choobineh et al. (2004) utilized the NMQ as a questionnaire to identify musculoskeletal disorders in carpet menders following the observation with the Rapid Upper Limb Assessment (RULA) technique. As a result, Choobineh et al. recommended a new workstation, which improved working posture in 57% of the cases, and the comfort was increased. In 2005, Lei presented a study that investigated the risk factors for the prevalence of musculoskeletal symptoms, i.e. ache, pain or discomfort, among foundry workers in China using the NMQ, and the results suggested interventions for low back pain should be the first priority.

Since there was no reliability outcome relevant to this research into hairdressers, a reliable NMQ must be selected and then modified, based on hairdressers' specified tasks, with the purpose of meeting the needs of this research. In this study, a hairdresser-oriented musculoskeletal questionnaire was conducted, based on the study conducted by Chen et al (2003) and Miranda et al (2001). Furthermore, a step-by-step confirmation approach is employed in the present study in order to increase reliability, shown as follows:

- The background information regarding independent variables such as age, working experience, and occupational status, i.e. working hours per week, break-taking;

- Tasks and Equipment;
- Ergonomic assessment such as repetitive wrist movement, arm up above shoulder, lower back bending in work;
- The WMSD history from clinical diagnosis, i.e. Tendinitis, lower back pain, Carpal Tunnel Disorders;
- Self-assessment of level of discomfort and symptoms associated with twelve body regions.

Thus, this study intends to employ the questionnaire approach to a risk factors investigation into Taiwanese hairdressers' work-related musculoskeletal disorders.

3. METHODS

3.1 SUBJECT SELECTION

Twelve professional Taiwanese hairdressers were invited to join this pilot study in Taiwan using a hairdresser-oriented musculoskeletal questionnaire developed for this study. Their average age was 22.75 ± 3.79 years; the average working experience was 70 ± 43.95 months; the mean working hours was 49.58 hours per week. All subjects are right handed.

3.2 HAIRDRESSERS' ORIENTED MUSCULOSKELETAL QUESTIONNAIRE

A hairdresser-oriented musculoskeletal questionnaire was conducted, based on the NMQ, and then developed. The NMQ has been modified and applied to other oriented occupations such as restaurant workers in Taiwan by Chen *et al* (2003), and forestry workers in Finland (Miranda *et al*, 2001). The survey data were collected and analysed using SPSS version 13. Because the sample size is small, non-parameter analyses, such as the Pearson χ^2 test and Spearman Correlation Analysis, were applied to these raw data.

4 RESULTS

4.1 RELIABILITY

The hairdresser-oriented musculoskeletal questionnaire approach has represented a very high level of reliability on a five-point scale of discomfort for twelve body regions (Cronbach's alpha = 0.95). Therefore, the results collected, based on a step-by-step confirmation approach, are reliable.

4.2 DISCOMFORT IN BODY REGIONS

91.7% of subjects reported shoulder discomfort, followed by lower back (83.3%) and neck (75%). This result validates a level of discomfort among body regions as being the same as in previous research by Wu *et al* (2004) and Chuang (2005). Moreover, 33.4% reported a 'mild-to-moderate' level of shoulder discomfort, followed by neck (25%) and lower back (25%). Therefore, among hairdressers, the shoulder region is the most likely to suffer bodily discomfort.

Furthermore, Spearman Correlation Analysis indicates that the level of discomfort has the strongest positive relation with the level of discomfort in the body region of the neck ($r=0.664$, $p<0.05$), followed by the upper arm ($r=0.661$, $p<0.05$) and the wrist/fingers ($r=0.542$, $p<0.05$). Therefore, the body regions showing discomfort are likely to be associated with the upper limbs.

4.3 SYMPTOMS

The study investigates the symptoms of discomfort reported by the subjects. The results show that 88.9% of subjects reported arthritic pain in the neck, followed by the shoulder (66.7%) and lower back (66.7%). Moreover, 22.2% of subjects reported numbness and pins and needles in the neck, followed by shoulder pain (16.7%) and lower back pain (16.7%). The result further proves that the body regions suffering most discomfort are likely to be the neck, shoulders and lower back.

4.4 AGE

Participants were approximately 22.75 ± 3.79 years old and were divided into two groups: (1) 19 ~ 22.75 years old, 7 females, and (2) 22.75 ~ 32 years old, 5 females. After that, the Pearson χ^2

test indicates that there is a significant effect of age on discomfort in the lower back and lower leg ($p < 0.05$). Therefore, the ageing effect could be one of the risk factors leading to discomfort the lower back and lower leg.

4.5 TASKS

The Pearson χ^2 test indicates that using a bottle of water when washing clients' hair significantly increases the level of discomfort in the upper arm ($p < 0.01$). Therefore, standing-up when washing clients' hair should be avoided. However, the other hairdressing tasks do not significantly affect discomfort in body regions ($p > 0.05$).

4.6 WORKING EXPERIENCE

Participants have approximately 70 ± 43.95 months of working experience and are further divided into four groups: (1) 15 ~ 42.6 months, 3 females, (2) 42.6 ~ 60 months, 3 females, (3) 60~75.75 months, 3 females and (4) over 75.75 months, 3 females. After that, Pearson χ^2 test indicates that there is no significant effect of working experience on discomfort in body regions ($p > 0.05$). Therefore, working experience may not be a risk factor which results in discomfort of body regions.

4.7 WORKING HOURS

Participants work approximately 49.58 ± 19.57 hours per week and are further divided into four groups: (1) 16 ~ 33.33 hours, 3 females, (2) 33.33 ~ 52 hours, 3 females, (3) 52 ~ 65 hours, 3 females, and (4) over 65 hours, 3 females. After that, the Pearson χ^2 test indicates that longer working hours significantly increase the level of discomfort in the upper arm ($p < 0.05$). Therefore, longer working hours are likely to increase the level of discomfort in the upper arm.

4.8 TAKING A BREAK

Participants take approximately 6.25 ± 8.465 mins per break. These were divided into four groups: (1) no break at all, 5 females (2) 5~9 mins, 4 females, and (3) over 9 mins, 3 females. After that, the Pearson χ^2 test indicates that taking a longer break could significantly reduce the level of

discomfort in the lower leg ($p < 0.05$). Therefore, taking longer a break could possibly prevent lower leg discomfort.

4.9 OPEN-ENDED QUESTION

The open-ended question is used in the last section of this questionnaire and was completed by those hairdressers who had any opinions about WMSDs. From the opinions collected, the provision of a height-adjustable washbasin would improve the facilities. Moreover, poor working postures induce body discomfort when employees attempt to correct them, and if the ache or pain appears after work, then a hot compress could be applied to the area where the muscles are affected.

5. DISCUSSION

The study points out that the majority of subjects report arthritic neck, shoulder and lower back pain, with the body regions showing greatest discomfort being the shoulder, lower back and neck. The result is consistent with current studies. Moreover, some risk factors have been found associated with a level of discomfort among body regions: the ageing effect could increase the level of discomfort in the lower back and lower leg; longer working hours are likely to increase the level of discomfort in the upper arm; taking a longer break could possibly prevent lower leg discomfort. In addition, standing-up should be avoided while washing clients' hair as this might prevent discomfort of the upper arm.

This study is based on subjective self-assessment; the reason that various tasks may not be risk factors which increase the level of discomfort among body regions is because these individual task performances can be investigated only via empirical observation. Thus, the causes of discomfort in the various body regions remain unknown.

Since shoulder discomfort is highly associated with the arm and neck, this study suggests that a further investigation into the tasks performed by the upper limbs is required; this may help to identify causes of shoulder discomfort. Moreover, because the sample size was small and cannot

be considered to be fully representative of the hairdresser population in Taiwan, it is proposed that in the future a large quantitative research based on a revised hairdresser-orientated musculoskeletal questionnaire be employed to validate the findings of this small study.

6. CONCLUSIONS AND FURTHER STUDY

This study aims to investigate the risk factors of WMSDs among hairdressers by identifying the body regions with significant discomfort. A comprehensive literature review was given. As a result, a hairdresser-orientated musculoskeletal questionnaire was conducted. The result indicates that most discomfort of the body regions is in the shoulder, lower back and neck. The result is consistent with current studies. Moreover, the study reveals that the ageing effect could increase discomfort level in the lower back and lower leg and that longer working hours may increase discomfort levels in the upper arm.

Although no particular hairdressing tasks were found to be associated with a significant effect on the levels of discomfort in particular body regions, it is suggested that a further investigation into the tasks required to be performed by the upper limbs and their possible relationship with employee discomfort should be undertaken. This may help in identifying causes of discomfort and their relation with working postures or other risk factors. Moreover, a large number of responses to the questionnaire from the present hairdresser population in Taiwan is necessary for the validation of the findings of this study. Further, an ergonomic investigation will be needed to decrease WMSD problems in order to improve work efficiency in the hairdressing industry.

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