



RPMME

Homepage: <http://publisher.uthm.edu.my/periodicals/index.php/rpmme>

e-ISSN : 2773-4765

Prevalence and Risk Factors of Low Back Pain and Shoulder Pain among Mechanics at Tyre Service Center at Taiping, Perak

Mazlina Kamarudzaman¹, Mohd Nasrull Abdol Rahman^{1*},
Nurul Elyna Asyiqen Mohd Zaki¹

¹Faculty of Mechanical and Manufacturing Engineering,
Universiti Tun Hussein Onn Malaysia, Batu Pahat, 86400, MALAYSIA

*Corresponding Author Designation

DOI: <https://doi.org/10.30880/rpmme.2022.03.01.111>

Received 01 Dec 2021; Accepted 01 April 2022; Available online 30 July 2022

Abstract: Symptoms and disorders of the musculoskeletal system (MSDs) are the most common reasons for absent from work in Malaysia. Physical work load and more specifically manual materials handling is generally considered to be an occupational risk factor for low back and shoulder complaints. A recent review of epidemiological literature revealed that pushing and pulling assessment is suggested to be a risk factor of musculoskeletal complaint. In light of that, this paper combines results of several studies to present an approach for evaluating not only the exerted hand forces, but also the low back and shoulder load during pushing and pulling in practice. This study was conducted in Taiping, Perak. Data was collected using a structure questionnaire which is Nordic Musculoskeletal Questionnaire (NMQ). A cross sectional questionnaire survey was carried out among 39 workers from several workshop with mainly pushing and pulling assessment. The NMQ was used to assess the exposure to pushing and pulling and other physical risk factors for low back and shoulder pain. Psychosocial factors at work were also assessed. The mean age of the respondents were 30 years. In this study, it was found that 68% automobile mechanics had been troubled with musculoskeletal symptoms. RAPP analysis shows that 55% automobile mechanics are in medium risk level to develop musculoskeletal symptoms due to extreme posture and hand grip. Initial and sustained exerted forces were not highly correlated with the mechanical load at the low back and shoulders within the studied range of the exerted forces. A clear association between pushing and pulling and musculoskeletal disorder may become apparent in several definitions of pain. Therefore, the objective of the present study was to examine the association between the Risk Assessment of Pushing and Pulling (RAPP) and Nordic musculoskeletal questionnaire (NMQ) among mechanics.

Keywords: Nordic Questionnaire, Low Back Pain, Shoulder Pain

*Corresponding author: mnasrull@uthm.edu.my

2022 UTHM Publisher. All right reserved.

penerbit.uthm.edu.my/periodicals/index.php/rpmme

1. Introduction

Car tyre service centres are considered to be among the most hazardous in the automotive environment. Various car tyre activities involve handling heavy objects such as installation and replacing a tyre and rim [1]. Explored that automobile mechanics involved in great physical risk tasks due to working in standing, sitting and lying position for long periods of time in awkward postures [2]. Parts of human body that often exposed by musculoskeletal disorders are back, neck, arms and hands [3]. The term musculoskeletal disorders (MSDs) refer to conditions that involve the nerves, tendons, muscles and supporting structure of the human body. Musculoskeletal disorders (MSDs) are widespread and increasing occupational health problems in the workplace worldwide [4]. In many types of the occupational groups, MSDs are major causes of work related disability and lost time due to illness [5]. One tool for measuring musculoskeletal disorders is the Nordic Questionnaire (NMQ) and this instrument can be used to assess a general level of discomfort across the workforce, regardless of the source of pain [6]. The (NMQ) was developed by a team of Nordic researchers organized to create a simple standardized questionnaire that could be used for the screening of musculoskeletal disorders as a part of ergonomic programs and for epidemiological studies of musculoskeletal disorders [7].

Pushing and pulling is defined as the exertion of a (hand) force by a person on an object or another person, the resultant force of which is directed horizontally [8]. Aside from that definition, a distinction can be made between P&P while walking in order to move an object, such as a trolley, and P&P while standing in order to operate an instrument, such as a lever [9]. When pushing and pulling objects, the weight of the object or conveyance, including its contents, affects the force required of the worker. Often workers have to slide objects on a table or flat surface. In these cases, the weight and the friction characteristics of the object and the surface are the prime determinants of the force required. Pushing and pulling are also necessary to transport large quantities of packed goods on wheeled carts and are more or less hidden activities of several other tasks.

2. Materials and Methods

A cross sectional questionnaire survey was carried out among male mechanics only, for which it was expected that pushing and pulling was common activity, were approached to participate in the study. A few of workshops were selected for participation after the approval of the management. The questionnaires were given to all staff that willing to participate. First of all, participants only need to fill out the NMQ and a demographics questionnaire. During the visit, researchers filled out other questionnaire that related to the risk assessment of pushing and pulling (RAPP) during observation. This study was approved by the police department during Malaysian movement control (MCO) during pandemic COVID-19 and all participants provided informed consent before participating in the study. This study was conducted at Taiping, Perak. This was a cross sectional descriptive study carried out among mechanics in ten car tyre service centers in Taiping. Total sampling was used. There were 39 workers in the various mechanics. All participant accepted to participate in the study.

The Nordic Musculoskeletal Questionnaire (NMQ) was preferred as a data collection instrument by investigator, as because it is widely used by ergonomist and occupational health professionals as a standardized tool to find out the prevalence and associated physical and psychological risk factors of musculoskeletal symptoms from different working population by easy, quick and a systematic way [10]. The questionnaire was used to obtain information on the socio-demographic characteristics of the respondents, job history. Completion is aided by a body a body map to indicate nine symptoms sites being neck, shoulders, upper back, elbows, low back, wrist/hands, hip/thighs, knees and ankles/feet. Data collection lasted for 5 days.

Meanwhile, Risk Assessment Pushing and Pulling (RAPP) was used to identify the physical risk level of developing musculoskeletal symptoms among automobile workers. This tool is designed to help assess the key risks in manual pushing and pulling operations involving whole-body effort such as moving loaded trolleys or roll cages, or dragging, hauling, sliding or rolling loads. The data collected were edited manually, entered into computer and analysed using the Statistical Package for the Social Sciences (SPSS) version 20. Data analysis was done using descriptive statistics (Frequency, proportions, means and standard deviation to summarize variables).

3. Results and Discussion

3.1 Results

Table 1: Demographic Data (n=39)

Characteristics	N	%
Gender		
<i>Male</i>	39	-
Age	-	--
<20	0	0
20-40	34	88
40>	5	12
Employment duration		
1-3 years	12	31
4-5 years	20	51
More than 6 years	7	18
Daily working hours		
Up to 8 hours	33	85
More than 8 hours	7	15

A total of 39 mechanics participated in the study giving a response rate of 100%, with a mean age of 30 years. Three-quarters of the respondents hold the job title as main worker and 84% of participants worked daily more than 8 hours in automobile workshop and garage.

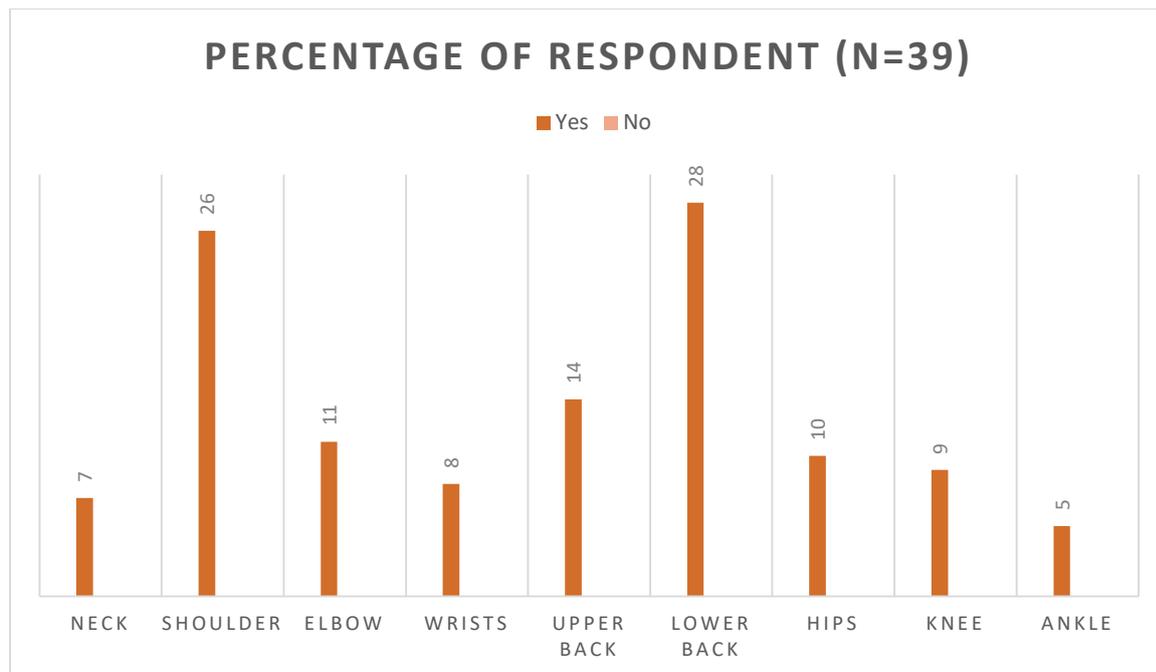


Figure 1: The prevalence of musculoskeletal symptoms in in body regions at last 12 months

In this study, it was found that 68% automobile mechanics had been troubled with musculoskeletal symptoms in at least one region in the body over the last 12 months. Table 1 illustrated that there was sign musculoskeletal symptoms prevalence in the last 12 months preceding data collection and job title and daily working hours.

Table 2: Reported risk factors in pushing and pulling assessment related to musculoskeletal symptom.

Reported physical risk factors	Respondent (%)		
	Good	Reasonable	Poor
Posture	10 (26%)	23 (59%)	6 (23%)
Hand grip	17 (44%)	15 (39%)	7 (18%)
Work pattern	25 (64%)	11 (28%)	3 (7%)
Travel distance	29 (74%)	9 (23%)	1 (2%)
Condition of equipment	30(77%)	9 (23%)	0
Floor surface	31 (79%)	6 (23%)	2 (5%)

On the other hand, Table 2 demonstrates that there is highly significant association between reported musculoskeletal symptoms in the last 12 months and the risk of assessment pushing and pulling in posture, hand grip, work pattern, travel distance, condition of equipment and floor surface. Furthermore, Table 2 reveals that 55% automobile mechanics are in medium risk level to develop musculoskeletal symptoms due to extreme posture and hand grip. Significant association was found between at least one region pain in last 12 months & RAPP score ($p=0.000$) for developing musculoskeletal symptoms.

3.2 Discussions

The objective of the present study was to examine the relationship between risk assessment pushing and pulling and Nordic musculoskeletal symptom which indicates the most affected area to low back pain and shoulder pain. In this study, it found lower back pain as the most prevalent body area (72%) in our study. Other prevalent body areas of this study are shoulder and upper back. A study in Bangladesh estimated that 78% of professional car drivers suffer from LBP. From the various studies showed that lower back pain was the most prevalent musculoskeletal symptoms in Norway (76%) 6 and United Kingdom (65%) 4 among the automobile mechanics. Low back pain in the health setting is therefore a common problem as reported in many studies. Meanwhile for the risk evaluation of pushing and pulling during work situations is generally aimed at the assessment of initial exerted forces, required to accelerate the object, and sustained exerted forces to keep the object at a more or less constant velocity. The initial and sustained forces are usually compared to psychophysically determined maximum acceptable forces corresponding to the actual work situation[11]. Low back pain is one of the most common symptoms of musculoskeletal disorders in the work place [12]. This cross sectional study investigated the prevalence and possible risk factors associated with low back pain and shoulder pain among workers in the automobile service. Over a quarter of the health workers reported having low back pain and shoulder pain within the preceding 12-month period [13]. The proportion affected was substantial enough to possibly affect productivity at the workplace[14]. Pushing and pulling activities need considerable attention in the design of the working environment to prevent the development of musculoskeletal disorder. These include obesity, smoking, weight lifting, stooping, prolonged sitting, poor fitness level, especially among those with sedentary lifestyle and awkward posture at work.

4. Conclusion

Several potential risk factors of pushing and pulling had a significant effect on the mechanical load at the low back and shoulders. Inadequate evidence regarding musculoskeletal symptoms prevalence and its impact on quality of life of automobile mechanics are available in Taiping. The study result reveals that Taiping automobile workers are in risk due to the demand of poor ergonomic working environment by analyzing posture and pattern of movements. For the limitations of the study, many of the mechanic were not willing to spare too much time to be interviewed as they were on duty. This may have led to the withholding of certain information in order to save time. Also, the issue of self-reporting was considered a limitation as the findings of the study were entirely based on the information given by the respondents.

Acknowledgement

This research was made possible by funding from research grant number H581 provided by the Ministry of Higher Education, Malaysia. The authors would also like to thank the Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia for its support.

References

- [1] A. Nasrull, A. Faieza, and R. Yusuff, "Survey of body part symptoms among workera in a car tyre service centr," pp. 53–56, 2010.
- [2] S. Akter, M. M. Rahman, S. Mandal, and N. Nahar, "Musculoskeletal symptoms and physical risk factors among automobile mechanics in Dhaka , Bangladesh," vol. 6, no. 1, pp. 8–13, 2016.
- [3] M. A. Wahyudi, W. A. P. Dania, and R. L. R. Silalahi, "Work Posture Analysis of Manual Material Handling Using OWAS Method," *Ital. Oral Surg.*, vol. 3, pp. 195–199, 2015.
- [4] H. D. Luan *et al.*, "Musculoskeletal Disorders : Prevalence and Associated Factors among District Hospital Nurses in Haiphong , Vietnam," vol. 2018, 2018.
- [5] B. Deros, D. Darina, I. Daruis, and I. Mohamed, "A Study on Ergonomic Awareness among Workers Performing Manual Material Handling Activities," *Procedia - Soc. Behav. Sci.*, vol. 195, pp. 1666–1673, 2015.
- [6] J. O. Crawford, "The Nordic Musculoskeletal Questionnaire," pp. 300–301, 2007.
- [7] O. K. Aewboonchoo, H. Y. Amamoto, N. M. Iyai, S. M. M. Irbod, I. M. Orioka, and K. M. Iyashita, "The Standardized Nordic Questionnaire Applied to Workers Exposed to Hand-Arm Vibration," pp. 218–222, 1998.
- [8] M. J. M. Hoozemans, P. P. F. M. Kuijer, and M. H. W. Frings-dresen, "Mechanical loading of the low back and shoulders during pushing and pulling activities," no. December 2014, pp. 37–41, 2007.
- [9] C. E. Dickinson, K. Champion, A. F. Foster, S. J. Newman, A. M. T. O. Rourke, and P. G. Thomas, "Questionnaire development: an examination of the Nordic Musculoskeletal Questionnaire," pp. 197–201, 1992.
- [10] I. Dianat, M. Kord, P. Yahyazade, M. Ali, and A. W. Stedmon, "Association of individual and work-related risk factors with musculoskeletal symptoms among Iranian sewing machine operators," *Appl. Ergon.*, vol. 51, pp. 180–188, 2015.
- [11] K. Al-omari and H. Okasheh, "The Influence of Work Environment on Job Performance : A Case Study of Engineering Company in Jordan," vol. 12, no. 24, pp. 15544–15550, 2017.
- [12] F. J. H. wan D. M J M Hoozemans, A J Van der Beek, M H W Frings- DResen, L H V van der Woude, "Pushing and pulling in association with low back and shoulder complaints," pp. 696–702, 2002.
- [13] M. J. M. Hoozemans, P. P. F. M. Kuijer and M. H.W. Frings-dresen, "Pushing and pulling in association with low back and shoulder complaints," pp. 696–702, 2002.
- [14] K. B. Haven, P. Magnus, K. Vetlesen, "Neck / shoulder and low-back disorders in the forestry industry : relationship to work tasks and perceived psychosocial job stress," pp. 37–41, 2010.