Pertanika J. Soc. Sci. & Hum. 23 (2): 315 - 324 (2015)

PERTANIKA JOURNALS

SOCIAL SCIENCES & HUMANITIES

Journal homepage: http://www.pertanika.upm.edu.my/

Musculoskeletal Pain Among Migrant Workers in the Malaysian Manufacturing Industry: The Impact of the Physical Environment, Workload and Work Patterns

Santos, A., Ramos, H. M.*, Ramasamy, G. and Fernandes, C.

Department of Applied Psychology, University of Nottingham Malaysia Campus Jalan Broga, Semenyih, 43500, Selangor Darul Ehsan, Malaysia

ABSTRACT

Although migrant workers represent a substantial proportion of Malaysia's workforce and are acknowledged as a major contributor to Malaysia's rapid economic growth strategy, the risk of increasing musculoskeletal disorders among migrant workers in Malaysia has been largely ignored. The present study reports findings from a study of 317 migrant workers from the manufacturing industry. The aims of the study were to: a) assess overall levels of musculoskeletal pain, b) examine whether physical environment conditions were associated with musculoskeletal pain, and c) identify whether workload and particular work patterns were associated with the reporting of musculoskeletal pain. Data were obtained through self-report questionnaires administered by means of a series of structured interviews and analysed using logistic regression and odds ratios. Results suggest that the overall levels of musculoskeletal pain were high, with over two thirds of the respondents reporting symptoms of musculoskeletal pain. In terms of physical environment conditions, the lack of reliability of machinery/equipment and exposure to dust posed an increased risk for musculoskeletal pain. Workload and various work patterns such as working long hours, night shift working and pressure to meet quotas all contributed to an increased risk of musculoskeletal pain. Prevention efforts should include a transition to more healthful and reasonable working hours, scheduling practices as well as general improvement in the physical environment of factory premises.

Keywords: Physical environment, workload, working patterns, musculoskeletal pain, migrant workers

ARTICLE INFO

Article history:
Received: 03 December 2013
Accepted: 18 February 2014

E-mail addresses:
Hazel-Melanie.Ramos@nottingham.edu.my (Ramos, H.M.),
angeli.santos@nottingham.edu.my (Santos, A.),
Gandhi.Ramasamy@nottingham.edu.my (Ramasamy, G.),
calistus.fernandes@nottingham.edu.my (Fernandes, C.)
* Corresponding author

ISSN: 0128-7702 © Universiti Putra Malaysia Press

INTRODUCTION

Migrant workers represent a substantial proportion of Malaysia's workforce. Reports suggest that out of a labour force of approximately 12 million, the number of legal migrant workers in Malaysia was about 2 million as of 2007 (Department of Immigration, 2009). This represents a 9.4% increase in the number of migrant workers compared to 2006, when they numbered only about 1.87 million (Department of Immigration, 2009). The majority of migrants are low-to-medium skilled workers and have been used to fuel the country's rapid economic growth strategy. Although the Malaysian government has relied on migrant workers since the 1980s, there is no comprehensive policy regarding the recruitment and placement of such workers. Migrant workers are typically employed in one of five approved sectors by the government, namely the plantation, agriculture, construction, manufacturing and service sectors (News Straits Times, Apr 2012). The present study focuses specifically on migrant workers in the manufacturing sector due to the large proportion of workers in that sector. It is estimated that approximately 700,000 migrant workers are employed in manufacturing, accounting for the largest sector of employment for migrant workers (38.2%), followed by construction (16.0%), plantation (14.2%) and domestic services (12.5%) (The Star online, May 2012). In Malaysia, the majority of migrant workers are paid low wages, raising questions on the knock-on effects on overall levels of productivity and quality of skill of the labour force in the long term (Malaysian Insider, May 2012). Heavy reliance on low-skilled foreign labour is thought to trap the economy in a low-wage, low-skill equilibrium, slowing down the country's transformation into a highly-skilled economy. Nevertheless, foreign labour remains in great demand as many companies face difficulties in attracting local workers to take on low-wage jobs.

Migrant workers involved in construction, mining, agricultural work and heavy manufacturing often take on jobs with poor environmental safety measures often rejected by local workers. They are often exposed to a range of occupational hazards including exposure to toxic agents and lack protective clothing or other faulty equipment (Abdul-Aziz, 2001, Braunschweig & Carballo, 2001 in Joshi, 2011), and thus are more likely to suffer from occupational injuries and disability than local workers (Al-Arrayed & Hamza, 1995; & Mou *et al*., 2009 in Joshi, 2011). They are also forced to work extremely long hours, often comprising12-hour shifts, six days a week.

In the manufacturing industry, musculoskeletal disorders (MSDs) are a common phenomenon. MSDs affect the muscles, joints, tendons or spinal discs and are primarily caused by the nature of work performed and occupational injuries and accidents. Injuries are most likely to affect the back, shoulders, neck and legs. Data on occupational diseases reported by non-governmental employees to the national worker's social security organisation in Malaysia from 2002-2006, suggest that

the overall incidence rate for occupational diseases was 2.8 per 100,000 workers, with musculoskeletal disorders (28%) being one of the most frequently reported conditions. Workers in the non-metallic manufacturing industry have the highest average incidence rate of musculoskeletal disorders (3.5 per 100,000 workers) compared to all other industries (Abas *et al*., 2008). Migrant workers often end up experiencing pain, numbness, tingling and swelling in their bodies, reducing their ability to perform tasks, or even permanent disability if care and treatment are not sought. Often the biggest cause of injury comes from manual handling of heavy objects that includes lifting, lowering, pushing, pulling and carrying. Repetitive tasks in manufacturing work, even if the load is relatively light can also cause harm to the workers especially when performed in a less-than-ideal body position. Safety education, engineering control, workplace ergonomics and enforcement of workplace standards and incorporation of on-going surveillance system are important measures to facilitate the control and reduction of musculoskeletal diseases.

It is generally believed that MSDs are caused by multiple risk factors which have been generally categorised into physical (often biomechanical) and psychosocial risk factors. The biomechanical model suggests that there is an intimate association between some characteristics of work and mechanical load which give rise to MSDs. The psychosocial model, however, suggests that MSDs may be dependent upon the psychophysiological effects of work stress. The evidence for the latter has consistently shown that worker evaluations of work design and management (psychosocial factors) are associated with the report of such pain (Smith & Carayon 1996; Buckle & Devereux, 2000). While the biomechanical mechanism has been extensively researched (Buckle, 1997), the stress-related mechanism has received much less attention (Bongers *et al*., 1993). The present study seeks to identify the risk posed by specific physical environments and psychosocial factors on the reporting of musculoskeletal pain and discomfort caused or exacerbated by these hazards. Various mechanical factors such as heavy physical work, heavy or frequent manual operations, repeated rotation of the trunk, whole body vibration and prolonged sitting have traditionally been associated with low back pain, while work with hands at or above shoulder level, flexion of the neck, static contractions, monotonous or repetitive work, increased work pace and unsuitable work stations, have been associated with neck and shoulder pain (Hoogendoorn, *et al*., 1999; Ferguson & Maras, 1997; Ariens *et al*., 2000; Jensen & Eenberg, 1996). Relatively few studies, however, have examined the role of physical environment conditions in relation to MSDs.

The aims of the present study were threefold. First, it sought to assess incidence levels of musculoskeletal pain experienced by migrant workers in the manufacturing industry. Second, it sought to examine whether specific physical environment conditions such as exposure

to unpleasant smells, noise, dust and toxic substances and the lack of reliability of machinery/equipment and access to personal protective equipment in the factory premises were associated with the reporting of musculoskeletal pain. Lastly, it sought to identify whether particular work patterns such as working hours, unsociable hours, heavy workload and pressure to meet targets were associated with the reporting of musculoskeletal pain.

Evidence from the literature on psychosocial factors and musculoskeletal pain shows that nurses working in excess of 35 hours per week exhibited an increased risk of back injury (Engkvist *et al*., 2000). Lipscomb *et al*. (2002) found that MSD was related to extended work hours, especially off-shift and weekend hours. Because extended work schedules increase overall levels of workload while limiting rest and recovery time, such extended hours may result in increased musculoskeletal disorders (Spurgeon *et al*., 1997; Jansen *et al*., 2003).

METHODS

Study participants were administered a questionnaire in the form of a structured interview by a research assistant employed on the project. Questionnaires were verbally administered on site in order to overcome literacy issues. Convenience sampling was employed and migrant workers were recruited from areas near manufacturing industries in Kuala Lumpur and Selangor. Four companies involved in manufacturing plastics (toys) and electronics were invited to participate in the study. Approximately 300 participants were initially targeted for the study. A total of 320 questionnaires were administered, however, only 317 were completed in full, resulting in a response rate of 99%. The questionnaire was distributed during the period from March to April 2013and included the following sections

Demographic Information

Information on nationality, age, sex, position, years working experience, years working in Malaysia, daily hours of work, benefits and product type manufactured.

Physical hazards and work patterns were measured using selected items of a questionnaire entitled 'Work Environment Survey' by the Centre for Organisational Health and Development of the United Kingdom for use in a study on stress conducted in Her Majesty's Prisons, according to the risk assessment-risk management methodology developed by Cox *et al*. (2000). The model underpinning risk assessment and management was a relatively simple one. Before a problem can be addressed, it must be analysed and understood, and an assessment made of the risk that it presents. The risk assessment provides information on the nature of the problem, the stress-related hazards and the way they might affect the health of those exposed to them. The latter enables key features of the problem, known as likely risk factors, to be identified and some priority is given to them in terms of the nature and size of their possible effects or the number of people exposed to them. These data can then be used to inform the development of an action plan to address such problems. The details of the methodology, and the

questions that arise about its reliability and validity, were addressed in a major report to the UK Health and Safety Executive, also in 2000 (Cox, Griffiths, Barlow *et al*., 2000) that included six illustrative case studies. Needless to say, the methodology has been established as a valid and robust means of assessing physical and psychosocial work hazards in organisational settings, and has been heralded as 'best practice' in terms of assessing and managing risk by the UK Health and Safety Executive.

Physical Environment Hazards

Participants were asked to assess whether various physical hazards (smell, noise level, reliability of machinery/equipment, exposure to dust, exposure to toxic substances and access to personal and protective equipment were deemed a problem in their current work setting. Responses ranged from 1(not a problem) to 4 (always a problem).

Work Patterns

Participants were asked to assess whether the following work patterns were deemed a problem in their workplace: Long working hours, Unsociable hours (Night-shift working), heavy workload and pressure to meet quotas/targets at work. Responses ranged from 1 (not a problem) to 4 (always a problem).

Musculoskeletal pain was measured using a self-report measure developed by Cox *et al*. (2002:39) in a study measuring the causes and outcomes of stress at work among hospital staff. This measure was subsequently published in a study by Randall, Griffiths, Cox *et al*. (2002) and is consistent with other self-report measures of musculoskeletal pain (Bernard *et al*., 1994; Josephsen *et al*., 1997), which have demonstrated validity and good test-retest reliability. Participants were asked whether they experienced any muscular/ligament/tendon/joint discomfort or pain that was caused or made worse by work in the last 12 months. Responses were categorised as yes or no. In addition, respondents were asked to indicate where the discomfort/pain was located in an open-ended response item.

The completed questionnaires were encoded and analysed using SPSS v.20. Logistic Regression and Odds Ratio were used to test the relationships between the study variables.

RESULTS

Of the 317 respondents, 157 were male and 160 female. A total of 110 (34.7%) respondents were from Sri Lanka, 85 (26.8%) from Indonesia, 71 (22.4%) from India, 22 (6.9%) from Nepal, 20 (6.3%) from India and 9 (2.8%) from Myanmar. The mean age of respondents was 27.7 (SD 5.2) years. The mean number of years of work experience was 1.7 (SD 2.4) years, with a range from 0-12 years and 50% having worked in their present workplace for less than a year. The mean number of years working in Malaysia was 3.8 (SD 2.1) years, with a range from 1-20 years, with 90% of the respondents having worked between 1 and 5 years. Employees worked shifts that were 8, 12 or 14 hours long. The mean shift length was12.0 (SD 0.4) hours per day.

TABLE 1
Frequencies of Hazard and Musculoskeletal Pain Reporting

	N	No. (%) reporting as 'not a problem'	No (%) reporting as 'a problem'
Smell	317	248 (78.2)	69 (21.8)
Noise	317	198 (62.5)	119 (37.5)
Reliability of machinery	317	249 (78.5)	68 (21.5)
Dust	316	198 (62.5)	118 (37.2)
Toxic substances	316	299 (94.3)	16 (5.0)
Access to PPE	316	311 (98.1)	5 (1.6)
Long hours	317	232 (73.2)	85 (26.8)
Unsociable hours	317	283 (89.3)	34 (10.7)
Workload	317	226 (83.9)	91 (28.7)
Quota	316	266 (35.6)	50(15.8)
Musculoskeletal pain	317	113 (35.6)	204(64.4)

Table 1 summarises the frequency and percentage of respondents exposed to particular hazards and reporting musculoskeletal pain.

From Table 1, it can be seen that of the physical environment hazards, the proportion of individuals reporting exposure that a particular hazard was a problem was highest for noise (37.5%) and dust (37.2%), followed by exposure to unpleasant smells (21.8%), reliability of machinery/equipment (21.5%), exposure to toxic substances (5.0%) and access to personal protective equipment (1.6%). In terms of work patterns, workload (28.7%) was most problematic, followed by long working hours (26.8%), pressure to meet quotas/targets (15.8%) and unsociable hours and night shifts (10.7%).

TABLE 2
Odds Ratios (with 95% confidence intervals) Calculated for Reporting of Musculoskeletal Pain

Hazard	Odds Ratio	95% CI
Smell	1.61	.83 to 2.89
Noise	1.47	.90 to 2.38
Machinery	2.07	1.12 to 3.84
dust	5.70	1.11 to 2.99
Toxins	2.52	.70 to 9.05
PPE	0.36	0.05 to 2.18
Long hours	2.82	1.56 to 5.10
Unsociable hours	2.84	1.14 to 7.08
Workload	3.21	1.78 to 5.80
Quota	4.00	1.74 to 9.24

Over two thirds (64.4%) reported that they experienced work-related musculoskeletal pain.

Table 2 summarises the results of logistic regression analyses on the risk factors for musculoskeletal pain. From the table, it can be seen that for physical environment hazards, those who were exposed to dust were 5.7 times more likely to report musculoskeletal pain than those not exposed, while those reporting the reliability of machinery/equipment as problematic were 2.07 times more likely to report musculoskeletal pain than those who did not report machinery/equipment as problematic. Other physical environment hazards failed to reach significance. All items for work patterns achieved significance. This was highest for those reporting pressure to meet quotas (OR=4.00), followed by workload (OR=3.21), unsociable hours (OR=2.84) and long working hours (OR=2.82).

DISCUSSION

The present study was one of few to examine the influence of physical environment hazards and work patterns on musculoskeletal pain among migrant workers in the manufacturing sector in Malaysia. The results showed that musculoskeletal pain was not uncommon among this group of workers, with over two third reporting having experienced musculoskeletal pain that was caused or made worse by work in the last 12 months. These figures are significantly higher than the reported 28% for Malaysian workers but are somewhat lower than that reported by Chandrasakaran *et al*. (2003) where 83.4% of over 500 semiconductor assembly line workers in Malaysia reported musculoskeletal symptoms in the last year. The reason for the possible decline in symptom reporting in the present study compared to that conducted in 2003 is that access to personal protective equipment may have improved with time as few employees reported this as a problem. Another possible reason is that more effective training on the use of equipment/machinery and injury prevention measures may have also been introduced over time. Nevertheless, the significant odds ratio for equipment/machinery suggested that the lack of reliability of machinery/equipment remains a significant risk factor for MSDs. Moreover, exposure to dusts also increased risk for musculoskeletal pain.

Similarly, employees subjected to difficult work patterns such as high workload, long and unsociable working hours and pressure to meet quotas/targets were at an increased risk for musculoskeletal pain. Workload is said to have a direct effect on the presence of musculoskeletal pain. This is consistent with the study conducted by Bystrom *et al*. (2004) on Swedish assembly plant workers, which found that appraised workload had a unique effect on musculoskeletal symptoms from the neck, shoulder and upper and lower back.

Findings on working hours of the present study were consistent with findings from a study by Trinkoff *et al*. (2006), who found that work schedule independently increased nurses' risk of developing MSDs. An important finding of the latter study is that mandatory overtime was linked to increased prevalence of MSDs, with increasing risk of injury as time wore on. Working with less than 10 hours off between shifts and pressure to work in order to relieve staffing shortages from supervisors were both found to be directly related to all types of MSDs. Working long hours and night shift working are said to encroach on recovery and recuperation during and between workdays (Hughes & Stone, 2004; Sluiter *et al*., 2003). In the present study, pressure to meet targets/quotas posed the highest risk for MSDs, suggesting that musculoskeletal disorders were not only related to the temporal elements of work, but that there was an additional psychological component that interacted with the temporal element to produce increased risk. Future studies should examine this relationship in more detail.

The present study is not without limitations. As one of the few studies

on musculoskeletal disorders in the manufacturing sector conducted in Malaysia, there is much scope for further research in the area. Future studies should examine the role of other psychosocial variables at the level of the organisation such as organisational culture, safety culture, social support, relationships at work, among others, in order to gain a broader understanding of the biopsychosocial mechanisms underlying the development of musculoskeletal disorders. Further, a more detailed examination of individual level characteristics which may mediate the experience of musculoskeletal pain should be examined, such as Type A behaviour pattern, fatigue, motivation and energy (Bystrom *et al*., 2004). The measure of musculoskeletal pain in the study is a simple general index of experienced pain. Ideally, a measure of musculoskeletal pain should encompass a range of body regions and pain rating intensity. Because the survey instrument had to be verbally administered due to literacy issues, a simple appraisal of general pain was preferred. Nevertheless, the reliability and validity of self-reported musculoskeletal pain assessed by survey method has been deemed acceptable for the purposes of assessing risk factors (Kaergaard *et al*., 2000). Furthermore, the cross-sectional nature of the study did not allow a clear causal relationship between work factors and musculoskeletal pain to be established. Future studies should therefore endeavour to adopt a longitudinal design in order to ascertain causal relationships.

CONCLUSION

The contribution of the present study, however, is significant in that little is known about the experience of musculoskeletal disorders in the manufacturing sector in Malaysia and, therefore, these findings contribute to our knowledge of the problem. Indeed, the incidence of musculoskeletal pain reported is alarmingly high and suggests that the occupational health of migrant workers in the manufacturing sector of Malaysia is considerably at risk. In order for Malaysia to sustain its manufacturing industry over the long term, interventions to manage and prevent musculoskeletal disorders are vital. Prevention efforts should include a transition to more healthful and reasonable working hours, scheduling practices as well as a general improvement in the physical environment of factory premises.

REFERENCES

Abas, A. L., Said, A. R. M, Mohammed, M. A. A., & Sathiakumar, N. (2008). Occupational disease among non-governmental employees in Malaysia: 2002-2006. *International Journal of Occupational and Environmental Health, 4*, 263 – 271.

Abdul-Aziz, A. (2001). Bangladeshi migrant workers in Malaysia's construction sector. *Asia- Pacific Population Journal, 16*(1), 3, 22 - 26.

Al-Arrayed, A., & Hamza, A. (1995). Occupational injuries in Bahrain. *Occupational Medicine, 45*(1), 231-233.

Ariens, G. A., van Mechelen, W., Bongers, P. M., Bouter, L. M., & van Der Wal, G. (2000). Physical risk factors for neck pain. *Scandinavian journal of work, environment & health,* 7-19.

Augustin, S., & Lee, K. K. (2012, April 12). Time to weed out the illegals. *The New Strait Times.* Retrieved June 20, 2013 from http://www.nst.com.my/nation/general/time-to-weed-out-the-illegals-1.73181#ixzz2agiy7ls7.

Bernard, B., Sauter, S., Fine, L. J., Petersen, M., & Hales, T. (1994). Job task and psychosocial risk factors for work-related musculoskeletal disorders among newspaper employees. *Scandinavian Journal of Work, Environment & Health, 20*, 417-426.

Buckle, P. (1997). Work factors and upper limb disorders. *British Medical Journal, 315,* 1360-1363.

Buckle, P., & Devereux, J. (2000). *Work-related neck and upper limb musculoskeletal disorders*. Luxembourg: Office for Official Publications of the European Communities.

Byström, P., Hanse, J. J., & Kjellberg, A. (2004). Appraised psychological workload, musculoskeletal symptoms, and the mediating effect of fatigue: A structural equation modeling approach. *Scandinavian journal of psychology, 45*(4), 331-341.

Chandrasakaran, A., Chee, H. L., Rampal, K. G., & Tan, G. L. E. (2003). The prevalence of musculoskeletal problems and risk factors among women assembly workers in the semiconductor industry. *Medical Journal of Malaysia, 58*(5), 657-666.

Cox,T., Griffiths, A., & Randall, R. (2002). *Interventions to control stress at work in hospital staff.* Colegate, Norwich: HSE Books.

Cox, T., Griffiths, A., & Rial-González, R. (2000). Research on work-related stress: European Agency for Safety and Health at Work. *Research on work-related stress: European Agency for Safety and Health at Work*.

Cox, T., Griffiths, A., Barlow, C., Randall, R., Thomson, L., & Rial-Gonzalez, E. (2000). *Organisational interventions for work stress: A risk management approach. Sudbury*: HSE Books.

Department of Statistics Malaysia (2009, February). *Labour and human resource statistics series 10*. Retrieved January 26, 2014 from http://www.statistics.gov.my/portal/download_Labour/files/BPTMS/PST-Siri10.pdf

Engkvist, I. L., Hjelm, E. W., Hagberg, M., Menckel, E., & Ekenvall, L. (2000). Risk indicators for reported over-exertion back injuries among female nursing personnel. *Epidemiology, 11*(5), 519-522.

Ferguson, S. A., & Marras, W. S. (1997). A literature review of low back disorder surveillance measures and risk factors. *Clinical Biomechanics, 12*(4), 211-226.

Hoogendoorn, W. E., van Poppel, M. N., Bongers, P. M., Koes, B. W., & Bouter, L. M. (1999). Physical load during work and leisure time as risk factors for back pain. *Scandinavian journal of work, environment & health,* 387-403.

Hughes, R., & Stone, P. (2004). The perils of shift work: Evening shift, night shift, and rotating shifts: Are they for you?. AJN *The American Journal of Nursing, 104*(9), 60-63.

Jansen, N., Kant, I., van Amelsvoort, L., Nijhuis, F., & van den Brandt, P. (2003). Need for recovery from work: Evaluating short-term effects of working hours, patterns and schedules. *Ergonomics, 46*(7), 664-680.

Jensen, L. K., & Eenberg, W. (1996). Occupation as a risk factor for knee disorders. *Scandinavian journal of work, environment & health,* 165-175.

Josephsen, M., Lagerstrom, M., Hagberg, M., & Hjelm, E. W. (1997). Musculoskeletal symptoms and job strain among nursing personnel: a study over a three-year period. *Occupational and Environmental Medicine, 54*, 68-685.

Joshi, S., Simkhada, P., & Prescott, G.J. (2011). Health problems of Nepalese migrant working in three Gulf countries. *BMC International Health and Human Rights, 11,* 3.

Kok, C. (2012, May 16). M'sia aims to reduce low-skilled foreign workers. *The Star*. Retrieved June 20, 2013 from http://www.thestar.com.my/story.aspx?file=%2f2012%2f5%2f16%2fbusiness%2f11297787&sec=business

Kaergaard, A., Andersen, J. H., Rasmussen, K., & Mikkelsen, S. (2000). Identification of neck-shoulder disorders in a 1-year follow-up study. Validation of a questionnaire-based method. *Pain, 86(*3), 305-310.

Lipscomb, J. A., Trinkoff, A. M., Geiger-Brown, J., & Brady, B. (2002). Work-schedule characteristics and reported musculoskeletal disorders of registered nurses. *Scandinavian journal of work, environment & health,* 394-401.

Malaysian Insider. (2012, May 15). We can reduce foreign labour numbers by 10-20pc, says Mustapa. *The Malaysian Insider*. Retrieved 20 June, 2013 from http://www.themalaysianinsider.com/print/malaysia/we-can-reduce-foreign-labour-numbers-by-10-20pc-says-mustapa.

Mou, J., Cheng, J., Zhang, D., Jiang, H., Lin, L., & Griffiths, S. M. (2009). Health care Utilisation amongst Shenzhen migrant workers: Does being insured make a difference? *BMC Health Service Research, 9*, 241.

Randall, R., Cox, T., Griffiths, A., Welsh, C. (2002). The activation of mechanisms linking judgements of work design and management with musculoskeletal pain. *Ergonomics, 45*(1), 13-31.

Sluiter, J. K., De Croon, E. M., Meijman, T. F., & Frings-Dresen, M. H. W. (2003). Need for recovery from work related fatigue and its role in the development and prediction of subjective health complaints. *Occupational and Environmental Medicine, 60*(suppl 1), i62-i70.

Smith, M. J., & Carayon, N. P. (1996). Work organization, stress, and cumulative trauma disorders. In S. D. Moon, & S. L. Sauter (Eds.). *Beyond biomechanics: Psychosocial aspects of musculoskeletal disorders in office work* (pp. 23-42). London: Taylor & Francis.

Spurgeon, A., Harrington, J. M., & Cooper, C. L. (1997). Health and safety problems associated with long working hours: A review of the current position. *Occupational and Environmental Medicine, 54(*6), 367-375.

Trinkoff, A. M., Le, R., Geiger-Brown, J., Lipscomb, J., & Lang, G. (2006). Longitudinal relationship of work hours, mandatory overtime, and on-call to musculoskeletal problems in nurses. *American journal of industrial medicine, 49*(11), 964-971.

Yuen, M. K. (2012, October 24). Indonesians make up nearly half of the 1.58 million legal foreign workers in the country. *The Star*. Retrieved June 20, 2013 from http://www.thestar.com.my/News/Nation/2012/10/24/Indonesians-make-up-nearly-half-of-the-158-million-legal-foreign-workers-in-the-country.aspx