"Musculoskeletal Symptoms Prevalence & Associated Physical Risk Factors: A Cross Sectional Study Among Automobile Mechanics''

By

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This thesis proposal is submitted in total fulfillment of the requirements for the subject RESEARCH 2 & 3 and partial fulfillment of the requirements for degree.

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STATEMENT OF AUTHORSHIP

Except where reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part form a thesis presented by me for any other degree or diploma or seminar.

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This thesis has not been submitted for the award of any other degree or diploma in any other tertiary institution.

The ethical issue of the body has been strictly considered & protected. In case of dissemination of the findings of this project for future publication, it will be duly acknowledged as undergraduate thesis.

Signature:…….. Date:……

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DEDICATION

The research is dedicated to my parents who are making everything worthwhile.

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All the praise must to Almighty Allah. When I started the study I didn't know whether I could complete it or not, but I believed, 'Fortune favors the brave'. So I was determined to try my best to make it a success and I am most grateful to Almighty Allah.

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LIST OFABBREVIATIONS

BHPI: Bangladesh Health Professions Institute

DMQ: Dutch Musculoskeletal Questionnaire

MSD: Musculoskeletal Disorder

MSS: Musculoskeletal Symptoms

REBA: Rapid Entire Body Assessment

WRMSD: Work Related Musculoskeletal Disorders

LIST OF APPENDIX

ABSTRACT

BACKGROUND: The magnitude of work-related health problem can be reduced by taking proper strategies and effective management such as ergonomic intervention. Statistics on musculoskeletal symptoms prevalence can help to develop concrete and effective program. However, there is no information about the musculoskeletal symptoms prevalence and associated physical risk factors among the automobile mechanics in Bangladesh.

AIM: The aim of this study was to determine the prevalence & associated risk factors of musculoskeletal symptoms among automobile mechanics.

METHOD: A cross-sectional study was performed with 100 automobile mechanics conveniently selected from Savar & Gabtali. Two questionnaires were used for the study. The DMQ was used to determine the prevalence & the REBA was used to identify the physical risk level of musculoskeletal symptoms among automobile mechanics.

RESULT: The prevalence of musculoskeletal symptoms during the last 12 months preceding data collection was reported 77% & at last 7 days was 81%. The most affected body parts was hips then the lower back & others were respectively. Socio-demographic factors were found to be significantly associated with musculoskeletal symptoms. Similarly, awkward posture, repetitive movement, force exertion, lifting & vibration were significantly associated to reports of musculoskeletal symptoms for the last 12 months & 7 days preceding data collection.

CONCLUSION: Results conclude that there is a high prevalence of musculoskeletal symptoms among automobile mechanics. The magnitude of musculoskeletal problem can be reduced by taking proper strategies and effective ergonomic management.

KEY TERMS: Musculoskeletal symptom, Physical risk factors, Socio-demographic risk factors

CONTENTS

CHAPTER-1: INTRODUCTION

The term Work Related Musculoskeletal Disorders (WRMSD) denote health problems of the loco motor apparatus of muscles, tendons, the skeleton, cartilage, ligaments & nerves (Luttman et al. 2003, p.7). Musculoskeletal disorders (MSDs) are common problem in the United Kingdom (UK) (Hussain 2004, p. 506). Not only the United Kingdom but also it is a burning issue in over the world (Torp, Riise & Moen 1996, p. 407). Every year more than 1 million people are affected by work-related musculoskeletal disorder in Bangladesh (Musculoskeletal disorder in Bangladesh 2010-11).

Musculoskeletal symptoms (MSSs) are developed by occupation related cause (Hussain 2004, p. 506). There are many people that are suffering from musculoskeletal symptoms while working in car repairing workshop or automobile workshop (Rahman, Aziz & Yusuff 2009, p. 137). Musculoskeletal symptoms which are often soft tissue injuries occur when there is a mismatch between the physical requirements of the job and physical capacity of the human body (European Agency for Safety and Health at Work 2007).

All activities that perform using musculoskeletal system are walking, sitting, running, playing, dancing, and working (European Agency for Safety and Health at Work 2007). The musculoskeletal system is a complex entity, composed of bones, joints muscles, tendons, ligaments, bursa, nerve and blood vessels (European Agency for Safety and Health at Work 2007). Postures and movements are dependent on the functioning of the musculoskeletal system but an overload of physically strenuous tasks may pose a threat to it (Rahman, Aziz & Yusuff 2009, p. 139). Awkward posture, repetitive work or handling heavy materials may damage the system and leading to musculoskeletal fatigue, pain or disorders (Rahman, Aziz & Yusuff 2009, p. 139). Several risk factors are associated with the development or exacerbation of MSDs in the workplace, including physical, biomechanical, individual predisposition psychosocial conditions (Bernard, BP 1997, p. 14).

The consequences of musculoskeletal disorders to individual & society can be avoided by protecting the production of garage as well as employees (Australian

Safety & Compensation Council 2005, p. 10). This problem should be reduce through ergonomics training or educating the workers about safety measure or organize the environmental condition (Rahman, Aziz & Yusuff 2009, p. 140).

1.1 Background information

Musculoskeletal disorders cover a broad range of health problems. There is clear evidence that strongly work related (European Agency for Safety & Health at Work 2007). Any job or work that involves heavy labor or manual material handling may be in a high risk category (Deros, Daruis & Ismail 2009, p. 1186). The automotive workshop or car repairing workshop is one of them. In this area, the person may have possibility to affect by musculoskeletal disorders. There are many people are injured while working in automotive workshop (Rahman, Aziz & Yusuff 2009, p. 137). In Norway, the researchers found that 96% of the automobile mechanics reported are affected by musculoskeletal symptoms. The respondents reported that they had been troubled with pain, ache or discomfort in one or more of the ten defined parts of the body during the past 12 months (Torp, Riise & Moen 1996, p. 409). The most common areas for developing musculoskeletal symptoms, the areas are low back, neck, shoulders, hip & knee (Torp, Riise & Moen 1996, p. 409).

Holmstrom et al. (cited in Torp, Riise & Moen 1996, p. 412) found that 92% of respondents reported that they had been trouble with musculoskeletal symptoms during the past 12 months.

Several studies found that individual & physical factors might contribute to the development of musculoskeletal symptoms. The injuries can occur from ergonomic factors such as awkward working postures, static load and task invariability to be some of the most important risk factors for musculoskeletal symptoms (Torp, Riise & Moen 1996, p. 407). Sometimes the injuries can occur from handling heavy objects, heavy lifting, and prolonged or sustained work in awkward postures (Rahman, Aziz & Yusuff 2009, p. 137).

The car mechanics work to repair the car within, under and around the car and can be characterized by the physical closeness to the working object (Morken, Haukenes and Magnussen 2012, pp. 1-2). In a study, the researchers found that many car repairs are

done under the bonnet and underneath the car. The car mechanics require performing this work with their spine flexed forward and/or with their arms flexed at or above shoulder level for prolonged periods. These working postures are strenuous for the back and shoulders & the mechanics have possibility to affect shoulder tendinitis (Torp, Riise & Moen 1996, p. 407). Most of the time car mechanics work standing on a floor made of cement or of similar hard materials. The people who continuously stand while working are more likely to suffer from pain and aching in the legs and low back than others (Torp, Riise & Moen 1996, p. 407).

Handling heavy objects such as installation & replacing a tire and rim may cause musculoskeletal symptoms (Rahman, Aziz & Yusuff 2009, p. 137). Awkward postures also responsible to develop musculoskeletal symptoms (Torp, Riise & Moen 1996, p. 407). Awkward postures typically include repeated or prolonged reaching, twisting, bending, working overhead, kneeling, squatting, and holding fixed positions or pinch grips (Rahman, Aziz & Yusuff 2009, p. 137). They may affect various areas of the body such as the hands, wrists, arms, shoulders, neck, back, and knees (Rahman, Aziz & Yusuff 2009, p. 137). In many studies found that working environment & psychosocial factors such as high workload and pacing, and lack of social support are also possible risk factors to develop musculoskeletal symptoms (Torp, Riise & Moen 1996, p. 407).

1.2 Significance of the study

In Bangladesh, there are many peoples are working in this area as a automobile mechanics. In Bangladesh there is no published research about the prevalence & associated physical risk factors of musculoskeletal symptoms among automobile mechanics. From this study the researcher will able to find out the prevalence & associated physical risk factors of musculoskeletal symptoms among automobile mechanics. Beside this, it will be help to established ergonomic guidelines for the automobile mechanics which are mandatory for the automobile mechanics. This study will also help to discover the lacking area of a automobile mechanics, especially about their posture before doing any activities in automobile workshop. Beside this it will be help to professional development which is mandatory for an occupational therapist in current situation. In the occupational therapy view, it is very important to know the ergonomic risk factors of automobile mechanics, because the occupational therapist

has a major role in the ergonomics area. It will help to discover the role and importance of occupational therapy in every sector of Bangladesh. Magazine of European Agency for Safety and Health at Work (2000, p. 5) claimed that MSDs may cause a great deal of musculoskeletal pain and suffering among afflicted workers. Workers experiencing aches and pains on the job may not be able to do quality work. During working the automobile mechanics work in awkward body posture, sometime slouch posture, often accompanied repetitive movements, force, posture and vibration (Rahman, Aziz & Yusuff 2009, p. 137). In addition, when car mechanics work they do not any concentration about their posture so suffered from MSDs. That's why the researcher is interested to conduct this research. After finishing the study, the researcher gets a result & the result will be used to conduct further study.

1.3 Aim of the Study

To determine the prevalence & associated physical risk factors of musculoskeletal symptoms among automobile mechanics

1.4 Objectives of the Study

- To find out the prevalence of musculoskeletal symptoms among automobile mechanics
- To identify the association between prevalence and associated socio-demographic factors & physical risk factors of musculoskeletal symptoms among automobile mechanics
- To determine the risk level of automobile mechanics

CHAPTER-2: LITERATURE REVIEW

2.1 Musculoskeletal symptoms

Musculoskeletal symptoms (MSSs) are a group of painful disorders of muscles, tendons, and nerves (Canadian Centre for Occupational Health & safety 2013). These symptoms can develop when the same muscles are used over & over again or for a long time without taking time to rest (Pain Management Health Center 2013). The chance of getting this type of injury increases if the force is high &/or the job requires an awkward posture. Some examples of musculoskeletal disorders include back pain, carpal tunnel syndrome, tendonitis & tenosynovitis (Canadian Centre for Occupational Health & safety 2013).

2.2 Symptoms of musculoskeletal disorders

According to Occupational Health & Safety (2011): symptoms are including-

1. Numbness or a burning sensation in the hand
2. Swelling or stiffness in the joints
3. Pain in wrists, forearms, elbows, neck or back followed by discomfort
4. Reduced range of motion in the shoulder, neck or back
5. Aching or tingling
6. Cramping
7. Weakness

2.3 Physical risk factors

Physical risk factors are the aspects of a job or task that make force a biomechanical stress on the worker. Physical risk factors are the most synergistic elements of musculoskeletal disorder hazards or problems (Environmental Health & safety 2005). There are different studies shown that the exposure to physical risk factors in the workplace can cause or contribute to the risk of developing the MSDs (Environmental Health & safety 2005). Musculoskeletal disorders arise from ordinary arm and hand movements such as bending, straightening, gripping, holding, twisting, clenching and

reaching (Dul & Weerdmeester 2008, p. 1). These common movements are not particularly harmful in everyday life while performing the ordinary activities (Canadian Centre for Occupational Health & Safety 2005). It makes them hazardous in work situations if it is the continual repetition, often in a forceful manner and most of all, the speed of the movements and the lack of recovery time (Environmental Health & safety 2005; Canadian Centre for Occupational Health & Safety 2005). MSDs are associated with work patterns that include (Canadian Centre for Occupational Health & safety 2013):

- Awkward postures
- Force
- Repetition
- Vibration
- Lifting

Generally, none of these factors acts separately to cause MSDs. MSDs commonly occur as a result of a combination and interaction among them (Canadian Centre for Occupational Health & Safety 2005; Environmental Health & safety 2005). Vibration also contributes to the development of MSD (Canadian Centre for Occupational Health & safety 2013 & Environmental Health & safety 2005).

2.4 Awkward posture

There are two aspects of body posture that contribute to the development of injuries in jobs involving repetitive tasks (Canadian Centre for Occupational Health & Safety 2005). The first relates to the position of the body part is upper limb, usually the upper limb that performs the actual task. Like the tasks that require repetitive movements to the extreme ranges of the joint in the wrists, elbows or shoulders contribute to the occurrence of a painful condition in those areas (Canadian Centre for Occupational Health & Safety 2005). Poor layout of the workstation and improper selection of equipment and tools can lead to these hazardous body movements (Dul & Weerdmeester 2008, pp. 10-15).

The other postural aspect is the fixed position of the neck and the shoulders. This postural aspect that's responsible for the contribution of MSDs (Canadian Centre for

Occupational Health & Safety 2005). To perform any controlled movement of an upper limb, the worker must need to stabilize the shoulder-neck region (Dul & Weerdmeester 2008, p. 5, 15). The muscles in the shoulder and the neck contract and stay contracted to hold the position stable for as long as the task requires, then the contracted muscles create pressure on the vessel (Dul & Weerdmeester 2008, p. 29). The contracted muscles squeeze the blood vessels & this restricts the flow of blood all the way down to the working muscles of the hand where the blood, because of the intense muscular effort, is needed the most (Canadian Centre for Occupational Health & Safety 2005). The neck-shoulder muscles become fatigued, even though there is no movement. This contributes to pain in the neck area. At the same time, the reduced blood supply to the remaining parts of the upper limb accelerates fatigue in the moving muscles, making them more susceptible to injury (Canadian Centre for Occupational Health & Safety 2005).

2.4.1 Maintaining same work positions or posture for a long period

The maximum people usually complaint that when they worked for a long time in the same position, they feel "stiff, sore and tired." There are some effects to the development of MSDs that result when tasks involve static postures (Environmental Health & safety 2005).

Static postures increase the amount of force on the muscles & required more force to do a task because, in addition to the force required performing the task. The effects of maintaining the same work positions can occur in almost all joint of the body. So the static posture has a major role to increase the MSDs (Dul & Weerdmeester 2008, pp. 15-21).

2.4.2 Sitting for a long time

The majority peoples are worked in a sitting position while performing any task, sitting for long periods without the opportunity to stand up and move around is another way in which employees are exposed to static loading of tissues, primarily in the lumbar area of the back. It can also affect the upper back, neck and legs. The problem is exacerbated where awkward postures are also present (Environmental Health & safety 2005).

Employees may be exposed to static postures when they must sit for a prolonged period on chairs, stools or benches that do not provide adequate lumbar support, that is, there is no back rest on the seat. (Dul & Weerdmeester 2008, pp. 15-21). When there is no lumbar support and the back is bent forward, the muscles of the back are trying to force the lumbar region out of it natural curve (proper alignment of the vertebrae), which places pressure on the discs and reduces blood supply to the spinal tissue. The constant exertion of the contraction forces leads to muscle fatigue (Smith 2008, p.197).

When the back muscles become sore, people tend to slouch & the posture more force is being placed on the back and the discs. As the static loading continues, pressure continues to be applied to the membranes of the discs and they may become stressed. Stressed discs, in turn, may put pressure on blood vessels and may pinch a nerve (sciatic nerve), which results in pain & discomfort (Environmental Health & safety 2005).

When the chair has a back rest with lumbar support to help maintain the back in a neutral position (Smith 2008, p. 209), employees still may continue to be exposed to static loading because they cannot take advantage of the back rest & the measurement of the back rest is not appropriate for the employees (Dul & Weerdmeester 2008, pp. 15-21). Many employees respond by sitting forward, instead of against the back rest, so that their feet can be on the ground, thus pressing the spine out of the natural curve and placing pressure on the discs (Smith 2008, p. 193).

2.4.3 Bending or twisting

Bending or twisting while manual handling creates an awkward posture and changes the way forces are distributed in the spine (Dul & Weerdmeester 2008, pp. 6-7). When the spine is in its natural position, forces are directed along the bony structure and distributed into the tissue as the spine curves. However, bending and twisting redirects the forces, placing more compressive and shear forces on the discs (Violante, Armstrong and Kilbom 2000, p. 8).

2.5 Repetition

Many jobs that involve repetition of the same job again and again are apparent even upon cursory observation: assembly line jobs where motions are repeated every few seconds, data processing jobs, mechanics, directory assistant operators, court reporting, letter and package sorting (Environmental Health & safety 2005). Workers performing highly repetitive tasks are at the highest risk for developing of MSDs (Violante, Armstrong and Kilbom 2000, p. 8). This evidence shows that repetition of movements is most likely the strongest risk factor for developing MSDs. Although, it never acts separately, it is the combination of many factors. Tasks requiring repetitive movements always involve other risk factors for MSDs such as fixed body position and force as well as lifting (Canadian Centre for Occupational Health & Safety 2005).

Repetitive movement jobs include performance of identical motions again and again (Sanders 2004, p. 9), but also include repeating multiple tasks where the motions of each task are very similar and involve the same muscles and tissues (Environmental Health & safety 2005). This is because the worker cannot fully recover in the short periods of time that are given between tasks. With time, the effort to maintain the repetitive movements, even if they involve minimal forces, steadily increases. When the work activity is continued in spite of the developing fatigue, injuries occur (Canadian Centre for Occupational Health & Safety 2005).

Evidence in the Health Effects section shows a strong association between the occurrence of MSDs and jobs involving exposure to repetitive motion (Sanders 2004, p. 9). The joints are most susceptible to repetitive motion injuries, especially the wrists, fingers, shoulders, and elbows. Repetitive work that is done with the foot (operating foot activated controls) or knees (climbing ladders or using a carpet kicker) may also result in an MSD (Environmental Health & safety 2005).

2.5.1 Performing motions constantly without short pauses or breaks in between (inadequate recovery time)

Pace of work determines the amount of time available for rest and recovery of the body between cycles of a particular task. The faster the pace, the less time is available

and the higher the risk for MSDs (Canadian Centre for Occupational Health & Safety 2005).

Jobs that do not provide short pauses or breaks between motions or task cycles are often a problem because there may not be adequate time for muscles to recover from the effects of the exertion before the motion must be repeated (Dul & Weerdmeester 2008, pp. 7-8). If there are no pauses between motions or the pauses are too short, the muscles cannot recover to the rested condition. Thus, the effects of the forces on the muscles accumulate and the muscles become fatigued and strained. The lack of adequate recovery time often occurs in jobs involving highly repetitive tasks (Dul & Weerdmeester 2008, pp.7-8). This happens when task cycle lengths are very short, which also means that the job involves a high number of cycle repetitions per minute. For example, some research shows that tendons and muscles in the wrists may not be able to recover where repeated task cycles are less than 5 seconds in length, that is, they are repeated more than 12 times per minute (Environmental Health & safety 2005).

Jobs involving constant muscle activity (static contractions) also may not provide adequate recovery time. These types of jobs may involve continuously holding hand tools (knife, paint brush, staple gun), which means that employees have constant exposure to static postures and low contraction forces (Environmental Health & safety 2005).

The longer motions or job tasks are performed, the less likely that there will be adequate recovery time (Dul & Weerdmeester 2008, pp. 7-9). The accumulation of exposure leads to muscle fatigue or overuse. In addition, where the intensity of exposure is greater, for example, in repetitive motion jobs that involve exposure to additional risk factors (force, awkward postures, or static postures), the increased forces required for the exertion also increase the amount of recovery time that is needed (Dul & Weerdmeester 2008, p. 7). Any part of the musculoskeletal system involved in moving the body is subject to injury where there is inadequate recovery time, and the recovery times needed vary by body part. For example, although employees may not be at high risk for forearm injury if task cycles are 25 seconds long or not repeated more than 3 times per minute, they may be at high risk of shoulder injury under this regimen (Environmental Health & safety 2005).

2.6 Forceful exertion

It is easy to understand why jobs that require employees to apply a lot of physical effort may involve significant exposure to ergonomic risk factors and pose an increased risk of MSDs (Environmental Health & safety 2005). The force required to do the task & the force also plays an important role in the onset of MSD (Canadian Centre for Occupational Health & Safety 2005). More force equals more muscular effort, and consequently, a longer time is needed to recover between tasks. Since in repetitive work, as a rule, there is not sufficient time for recovery, the more forceful movements develop fatigue much faster (Violante, Armstrong and Kilbom 2000, p. 65). Exerting force in certain hand positions is particularly hazardous. The amount of force needed depends on the weight of the tools and objects that the worker is required to operate or move and their placement in relation to the worker's body (Violante, Armstrong and Kilbom 2000, p. 63). More strength has to be used, the farther away from the body the force has to be applied. The shape of the tool plays an important role, also. Tools that do not allow the best position of the wrist, elbow and shoulder substantially increase the force required. Worn and poorly maintained tools are very important as well. For example, a worn screwdriver, pliers with worn jaws, or dull scissors can increase the operating force as much as tenfold (Canadian Centre for Occupational Health & Safety 2005).

Forceful exertions require an application of considerable contraction forces by the muscles, which cause them to fatigue rapidly during performing (Rahman, Aziz & Yusuff 2009, p. 139). The more force that must be applied in the exertion, the more quickly the muscles become fatigue. Excessive exposure to forceful exertions also leads to overuse of muscles and may result in muscle strain, soreness and damage (Rahman, Aziz & Yusuff 2009, pp. 139-140). Performing forceful exertions can also irritate tendons, joints and discs, which lead to inflammation, fluid buildup, and constriction of blood vessels and nerves in the area. Increased compression of nerves from the pressure imposed by inflamed tendons or muscle contractions may cause disorders of the nervous system (carpal tunnel syndrome and other nerve entrapment disorders) (Environmental Health & safety 2005).

Injuries related to forceful exertions can occur in any tissue or joint. As mentioned above, back injuries from overexertion are a leading cause of workplace injuries and workers' compensation cases. A number of studies also show that repeated forceful exertions of the hands and arms are associated with work-related MSDs (using tools, pinching or pushing with the fingers) (Environmental Health & safety 2005).

2.7 Vibration

Vibration affects tendons, muscles, joints, and nerves. Workers using vibrating tools may experience numbness of the fingers, loss of touch and grip, and pain (Canadian Centre for Occupational Health & Safety, 2005). Workers can be exposed to either whole body vibration or localized vibration (Canadian Centre for Occupational Health & safety 2013).

Vibration exposure can be caused for developing MSDs which occurred by power tools (Violante, Armstrong and Kilbom 2000, p. 15). In addition, the worker may use more force and awkward body positions because vibration hand tools are harder to control (Canadian Centre for Occupational Health & safety 2013).

2.8 Lifting heavy objects

Lifting is an activity that is an essential part of everyday life (Focht 2008, p. 174). The lifting of heavy objects have major role to increase MSDs (Violante, Armstrong and Kilbom 2000, p. 8). Workers lift, lower and move items every day. The heavier the weight that has to be lifted lowered and/or moved. The heavier the weight, the closer the contraction required of the muscles will be to their maximum capability (Canadian Centre for Occupational Health & Safety 2005). When muscles contract at or near their maximum, they fatigue more rapidly and the likelihood of damage to the muscle and other tissues involved in the activity (Violante, Armstrong and Kilbom 2000, p. 15).

2.8.1 Manual handling

Forceful manual handling activities are a leading cause of workplace injury and illness (Violante, Armstrong and Kilbom 2000, p. 16). Studies discussed in the Health

Effects section indicate that employees performing manual handling tasks have a significantly higher risk of back injury where they are exposed to force, repetition and/or awkward postures in the job (Environmental Health & safety 2005).

CHAPTER-3: METHOD AND MATERIALS

3.1 Study design

The investigator used cross sectional methods to conduct this study. The study aim was to find out the prevalence & associated physical risk factors of musculoskeletal symptoms among automobile mechanics. The cross sectional method was appropriate for this study as the issue was about prevalence & associated risk factors (Levin 2006).

3.2 Study setting

The study was conducted in Dhaka city at Savar & Gabtali. The investigator selected those places conveniently. The investigator selected that place where the automobile mechanics are available. The investigator found that there is many automobile mechanics are working in these areas.

3.3 Sampling procedure

The investigator selected 100 automobile mechanics conveniently from Savar & Gabtali. Here the investigator used the formulation of sample size determination: (n) = $z^2.pq/r^2$. The investigator used 90% confidence interval for this study, so the confidence interval (z) = 1.64 The investigator used 8% sampling error for this study, so the sampling error is r = 0.08. The investigator does not know how many people are working at this area in Bangladesh, that's why the investigator assume that the prevalence is (p) =0.5. & q =1-p. So q is =0.5, The participants were selected based on inclusion criteria & exclusion criteria.

3.4 Inclusion criteria

- Only the male participant's was selected. In Bangladesh, the automobile mechanics are male who work in the Garage & the females are not involved in this work. So only the male participants were selected (Morken, Haukenes and Magnussen 2012, p. 1).

- The selected participant's age was average 14-45 years. According to the Labour Law of Bangladesh 2006, the minimum legal age for employment was 14. That's why the participant's minimum age was 14. The participant's maximum age was 45 years. Above 45 years the person has possibility to affect different conditions like joint disease, postural abnormality and low back pain (Burnett 2009, p. 2).

- The participants needed a minimum of 12 month working experience preceding data collection. In this study, the researcher has used Dutch Musculoskeletal Questionnaire (DMQ). The DMQ had used for this type of participants who had a minimum 12 month working experience preceding data collection.

3.5 Exclusion criteria

- The workers who has joint disease, gout, diabetes and trauma during one year before data collection. Their symptoms are similar to as like work- related musculoskeletal symptoms (Punnett & Wegman 2004, p. 13).

3.6 Data collection instruments/tools

During data collection following instrument was used to fulfill the aim and objectives of the study

- The questionnaire
- Paper
- Pen & Pencil
- Information sheet
- Consent form

3.6.1 Dutch Musculoskeletal Questionnaire (DMQ)

The Dutch Musculoskeletal Questionnaire has been widely used to find the prevalence of musculoskeletal symptoms of different part of the body among different working population (Hildebrandt 2004). The DMQ questionnaire also covers the socio demographic characteristics like age, sex, employment status (Eltayeb, Staal & Kennes et al. 2007). The questionnaire includes item, asking about the experience of musculoskeletal symptoms in nine body areas (neck, upper back, lower back, shoulders, elbows, wrists, hips, knees & ankles) over the past week & over the past year. The Dutch Musculoskeletal Questionnaire was used to find out the prevalence & associated physical risk factors of musculoskeletal symptoms among automobile mechanics in the present study. Here, the investigator used health (2) & short version of Dutch musculoskeletal questionnaire in this study. The Dutch Musculoskeletal Questionnaire also comparable with Nordic questionnaire where the definition of body areas of body presented pictorially (Vincent 2005, p. 1-5). The advantage of this questionnaire is that it was a standardized questionnaire and easy to use. The validity of the questionnaire was analyzed in different studies (Vincent 2005, p. 1-5). The Dutch Musculoskeletal Questionnaire was a valid questionnaire & global assessment for measuring self- reported musculoskeletal workload as well as related symptoms which was applied to scientific research (Vincent 2005, pp. 1-5).

3.6.2 Rapid Entire Body Assessment (REBA)

It was used to find out the risk level of automobile mechanics. This observational tool is specifically designed to be sensitive to the type of unpredictable working postures found in health care and other service industries. To define the initial body segment codes, specified simple tasks were analyzed with variations in the load, movement distance and height. The REBA was a quick & easy observational postural analysis tool for whole body activities to measure the risk of injury (Hignett 2006). The postural analysis was a powerful technique for assessing work activities (Hignett & McAtamney 2000, p. 201). The movement & scoring system were used to analysis the postural movement. The position of the individual body segments was observed & the more there is deviation from the neutral posture the higher will the score of each body part (Hignett 2006). Observer was observed the participant and codes the point

according to their working posture & also codes the load/force & coupling (Hignett & McAtamney 2000, p. 201).

3.7 Data collection technique

Prior to data collection, a convenient time was scheduled in consultation with the authority of factories to avoid interruption in the flow of workers' daily production. At first, the investigator informed the participants about the contents of the consent form. Data collector collected data from those participants who gave consent. The investigator used Dutch Musculoskeletal Questionnaire (See Appendix-2A) to measure the prevalence & risk factors of musculoskeletal symptoms among automobile mechanics. The questionnaire was filled out according to report of the automobile mechanics. They showed the most affected part in picture. After that, the data collector used the REBA (See Appendix 2B) to identify the physical risk factors of musculoskeletal symptoms among automobile mechanics. The observation was done in the actual workplace of the worker during their daily work time. The workers were observed throughout the day. The focus of the observation was to identify and verify the presence of physical risk factor according to REBA. Risk factors were rated as present if the researcher observed the workers involved in any of the following: lift/ pull or push/ carry heavy loads (more than 20 kg); repetitive movement (repeated movements more than 4 times per minute); awkward and twisting movements (more than 20º flexion and extension movement of the trunk, neck, upper arms, lower arms, wrist and leg); bending or extended reaching for objects and maintaining the same postural position for an extended period of time (more than one hour). Exerting force during lifting, pulling, pushing; presence of vibration; scattered tools in the working environment (yes or no).

3.8. Ethical consideration

- Investigator has taken permission from the ethical committee of Bangladesh Health Professions Institute (BHPI).
- Investigator has taken permission from the authority of DMQ & REBA to use for the dissertation.

- Investigator also ensured that the confidentiality is maintained about the participants. The Investigator does not discuss about participants condition with other participants.
- All participants were informed about the aim of the study.
- Consent form was given to the participants & collected it.

CHAPTER-4: ANALYSIS AND RESULTS

4.1 Analysis

Data entry and analysis was performed by using the Statistical Package for social science (SPSS) 17. The presentation was performed in SPSS & in Microsoft Office Excel. Every question was rechecked for missing information double quoted response or unclear information. The variables were labeled in a list & the researcher established a computer based data definition record file that consisted of a list of variables in order. The researcher has put the id number of the variables in the variable view of SPSS & defined the types, width, decimal, label, & value. The next step was cleaning new data files to check that the input data was set to ensure that all data was accurately transcribed from the questionnaire sheet to the SPSS data view. Finally, the raw data was ready for analysis in SPSS.

4.1.1 Data Analysis process of DMQ

The investigator used the raw data in SPSS to find out the percentage of socio-demographic factors, prevalence of musculoskeletal symptoms in nine body regions & associated physical risk factors. For finding the percentage of socio-demographic factors & prevalence of musculoskeletal symptoms in nine body regions, the investigator used frequencies in SPSS. A chi-square test was conducted at with $p < .05$, to find out the association between the prevalence of musculoskeletal symptoms and socio-demographic and physical risk factors.

4.1.2 Data analysis process of REBA

The investigator used REBA questionnaire to find out the REBA score. The REBA questionnaire is observation based questionnaire; during observation the investigator observed the automobile mechanics trunk, neck, legs, upper arms, lower arms & wrists movement or position. The investigator observed the automobile mechanics minimum 35 minutes during working in automobile workshop. The investigator used specific score for specific movement or position. In trunk movement, the investigator used score 1 for trunk upright, score 2 for $0^0 – 20^0$ flexion or $0^0 – 20^0$ extension, score

3 for $20^0 – 60^0$ flexion, more than 20^0 extension & score 4 for more than 60^0 flexion. The investigator added score +1 if the trunk twisting or side flexed.

Similarly, the investigator used score for the movement of neck. In neck movement, the investigator used score 1 for $0^0 – 20^0$ flexion or $0^0 – 20^0$ extension & score 2 for more than 20^0 flexion or more than 20^0 extension. The investigator also added score +1 if the neck twisting or side flexed.

The investigator also used score for the position of legs. In legs position, the investigator used score 1 for bilateral weight bearing, walking / sitting & score 2 for unilateral weight bearing, feather weight bearing or an unstable posture. The investigator also added score +1 if the knee(s) flexed in between $30^0 – 60^0$ flexion & score 2 added for more than 60^0 flexion (not in sitting position).

Similarly, the investigator used score for the position of upper arms. In the position of the upper arms, the investigator used score 1 for 20^0 extension to 20^0 flexion, score 2 for more than 20^0 extension or 20^0 - 45^0 flexion, score 3 for 45^0 - 90^0 flexion & score 4 for more than 90^0 flexion. The investigator added score +1 if the arm(s) abducted or rotated or raised & used minus 1 for the leaning or supporting weight of arm or if posture is gravity assisted.

In the movement of lower arms, the investigator used score 1 for 60^0 - 100^0 flexion & score 2 for less than 60^0 flexion or more than 100^0 flexion.

In the movement of wrists, the investigator used score 1 for $0^0 – 15^0$ flexion or $0^0 – 15^0$ extension & score 2 for more than 15^0 flexion or more than 15^0 extension. The investigator also added score +1 if the wrist is twisted or deviated.

Then the investigator used REBA scoring sheet for the find out of group A & group B by using of table A & table B. Then the investigator added load/force with the score of table A & added coupling with the score of table B. Here, the investigator added score 0 for the load/force of less than 5 kg, score 1 for the load/force of 5-10 kg & score 2 for the load/force of more than 10 kg.

The investigator also added score 0 for good (well-fitting handle & a mid-range, power grip), score 1 for fair (hand hold acceptable but not ideal or coupling is acceptable via another part of the body), score 2 for poor (hand hold not acceptable

although possible), score 3 for unacceptable (awkward, unsafe grip, no handles, coupling is unacceptable using other parts of the body) of coupling.

Then the investigator found the result of score A & B. Then the investigator found the result of score C by using table C. After that the investigator added activity score +1 (1 or more body parts are static or repeated small range actions or action causes rapid large ranges in posture or an unstable base) with the score C. Then the investigator found the REBA score.

4.2 Result

4.2.1 Characteristics of the study participants involved in automobile mechanics job

Background Factors	N= 100	%
Age		
15-30	78	78
31-45	22	22
Educational qualification		
Up to primary	48	48
Up to secondary	52	52
Job title		
Main worker	76	76
Helper	24	24
Monthly income		
Less than 3000	8	8
3001-6000	32	32
More than 6000	60	60
Employment duration		
1-3 years	16	16
4-6 years	23	23
More than 6 years	61	61
Daily working hours		
Up to 8 hours	16	16
More than 8 hours	84	84
Taken sick leave		
Yes	92	92
No	8	8
Consultation any doctor/ therapist	38	38
Yes	62	62
No		

Table 1: Characteristics of the study participants involved in automobile mechanics job

N= number of worker, %= percentage of worker

The investigator selected 100 participants for this study. The participant's age range was 14-45. Here, the investigator used two categories of age that are 15-30 & 31-45. The maximum participant's age range was 15-30; the percentage was 86% & 14% for age range of 36-45. The investigator used two categories for identifying educational qualification; these are up to primary & secondary. 52% of all participants received education up to the secondary level & 48% participants received education up to primary level. There are two categories are used in this research; these are main worker & helper. 76% of all participants were main worker & 24% participants were helper. In this research, the investigator used three categories for identifying monthly income; these are less than 3000, 3001-6000 & more than 6000. The maximum participants' monthly income was more than 6000; the percentage is 60% & 32% of all participants monthly income was in between 3001-6000. 8% participants have monthly income less than 3000. The investigator used three categories for determining the employment duration. The maximum participants worked more than 6 hours; the percentage is 61% & 23% of all participants worked in between 4-6 years. 16% participants worked in between 1-3 years. Investigator used two categories for identifying daily working hours; these are up to 8 hours & more than 8 hours. 84% of all participants worked daily more than 8 hours & 16% participants worked daily up to 8 hours. In these studies, 92% of all participants were taken sick leave due to pain & 8% participants were not taken sick leave. 38% of all participants were consulted from any doctor & 62% participants were not consulted from any doctor.

4.2.2 The prevalence of developing musculoskeletal symptoms in nine body regions at last 12 months & 7 days prior to data collection

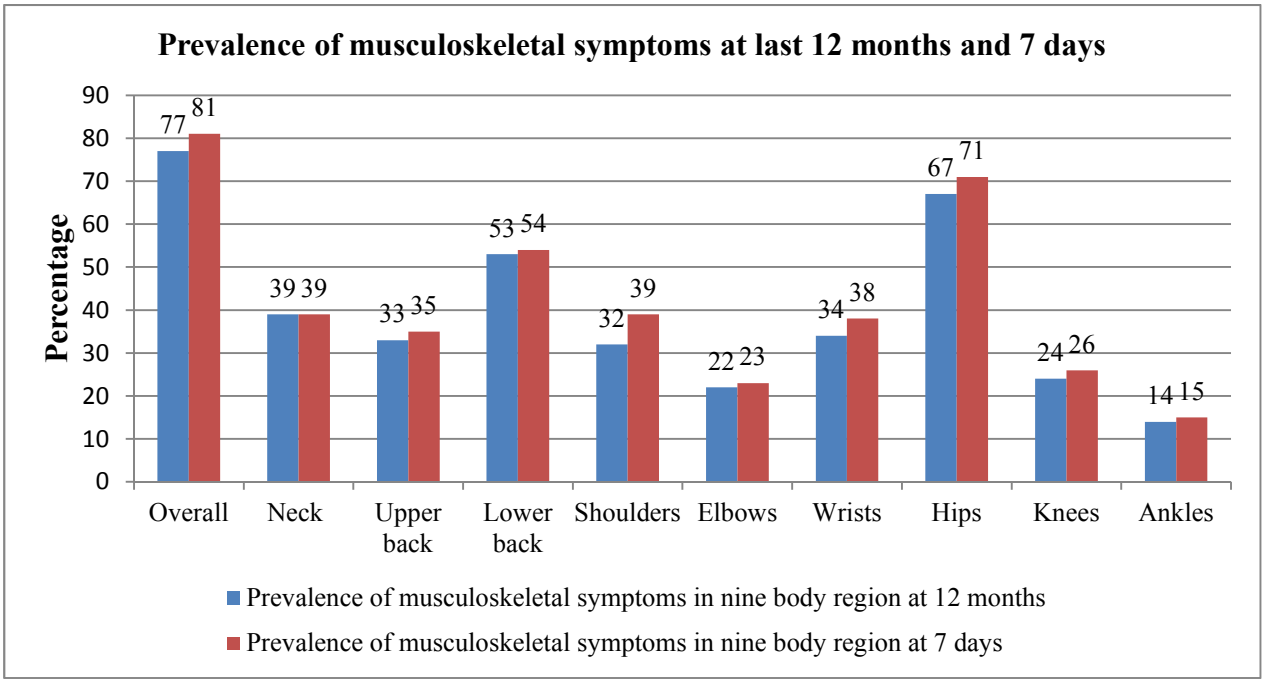

Figure 1: Prevalence (%) of Musculoskeletal Symptoms at last 12 months & 7 days preceding data collection in nine body regions

Figure 1 shows that the prevalence of musculoskeletal symptoms in nine body regions at 12 months & 7 days preceding data collection. In this study, the investigator found that 81% automobile mechanics had been trouble musculoskeletal symptoms at least one region pain in the body at last 7 days. Musculoskeletal symptoms were neck 39%, upper back 35%, lower back 54%, shoulders 39%, elbows 23%, wrists 38%, hips 71%, knees 26% & ankles 15% at last 7 days. In this study, the researcher found that 77% automobile mechanics had been trouble musculoskeletal symptoms at least one region pain in the body at last 12 months. The prevalence of musculoskeletal symptoms in the last 12 months were neck 39%, upper back 33%, lower back 53%, shoulders 32%, elbows 22%, wrists 34%, hips 67%, knees 24% & ankles 14%. Figure 1 shows that the most common body regions with high prevalence of musculoskeletal symptoms among study participants were lower back & hips.

4.2.3 Association between socio- demographic factors and reported musculoskeletal symptoms

Socio-demographic factors	At least one region pain at last 12 months			At least one region pain at last 7 days		
	Yes (%)	No (%)	P- value	Yes (%)	No (%)	P- value*
Age			.079			.180
15-30	57	21		61	17	
31-45	20	02		20	02	
Educational qualification			.648			.142
Up to primary	36	12		36	12	
Up to secondary	41	11		45	07	
Job title			.013			.001
Main worker	63	13		67	09	
Helper	14	10		14	10	
Monthly income			.000			.001
Less than 3000	01	07		05	03	
3001-6000	20	12		20	12	
More than 6000	56	04		56	04	
Employment duration			.002			.002
1-3 years	08	08		08	08	
4-6 years	15	08		19	04	
More than 6 years	54	07		54	07	
Daily working hours			.005			.001
Up to 8 hours	08	08		08	08	
More than 8 hours	69	15		73	11	
Consultation any doctor			.001			.006
Yes	36	02		36	02	
No	41	21		45	17	
Taken sick leave			.000			.164
Yes	76	16		76	16	
No	01	07		05	03	

*** Chi- square test**

Table 2: Association between socio- demographic factors and reported musculoskeletal symptoms at last 12 months and 7 days prior to data collection

In this study, significant association had present between at least one region pain in 12 months & job title (.013), monthly income (.000), employment duration (.002), daily working hours (.005), consultation any doctor (.001), taken sick leave (.000) but, no significant association between at least one region pain in last 12 months & age (.079), educational qualification (.648) for developing musculoskeletal symptoms.

Also, presented significant association between at least one region pain in last 7 days & job title (.001), monthly income (.001), employment duration (.002), daily working hours (.001), consultation any doctor (.006) but, no significant association between at least one region pain in last 7 days & age (.180), educational qualification (.142), taken sick leave (.164) for developing musculoskeletal symptoms (see Table 2).

4.2.4 Association between reported work related physical risk factors and reported musculoskeletal symptoms

Reported physical risk factors	At least one region pain at last 12 months			At least one region pain at last 7 days		
	Yes N (%)	No No (%)	P- value	Yes	No	P- value
Awkward posture			.012			.004
Yes	76	20		80	16	
No	01	03		01	03	
Repetitive movement			.001			.001
Yes	71	15		74	12	
No	06	08		07	07	
Force exertion			.000			.018
Yes	69	13		70	12	
No	08	10		11	07	
Lifting			.000			.000
Yes	67	11		70	08	
No	10	12		11	11	
Vibration			.001			.001
Yes	57	08		59	06	
No	20	15		22	16	

*** Chi- square test**

Table 3: Association between reported work related physical risk factors and reported musculoskeletal symptoms at last 12 month & 7 days prior to data collection

In this study, significant association had present between at least one region pain in last 12 months & awkward posture (.012), repetitive movement (.001), force exertion (.000), lifting (.000), vibration (.001) for developing musculoskeletal symptoms. Significant association also had present between at least one region pain in last 7 days & awkward posture (.004), repetitive movement (.001), force exertion (.018), lifting (.000), vibration (.001) for developing musculoskeletal symptoms.

4.2.5 The risk level of automobile mechanics according to REBA

In this study the investigator found that 44% automobile mechanics are affected by the category of low level & 56% automobile mechanics are affected by the category of medium level. In this study the investigator also found that 34% automobile mechanics are affected by the category of low level & 43% automobile mechanics are affected by the category of medium level at last 12 months. In this study our finding also shows that 39% automobile mechanics are affected by the category of low level & 42% automobile mechanics are affected by the category of medium level at last 7 days.

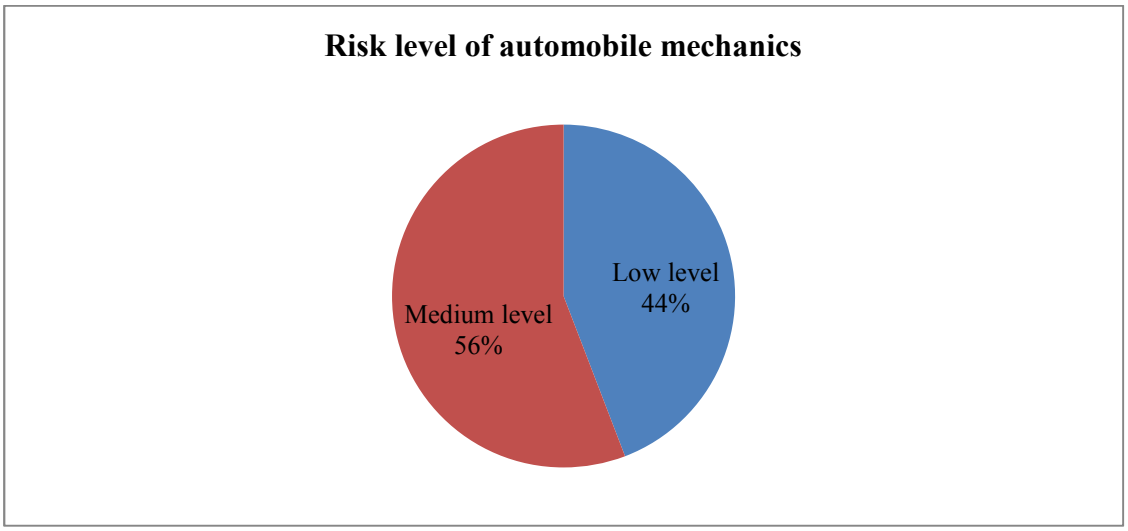

Figure 2: The risk level of automobile mechanics

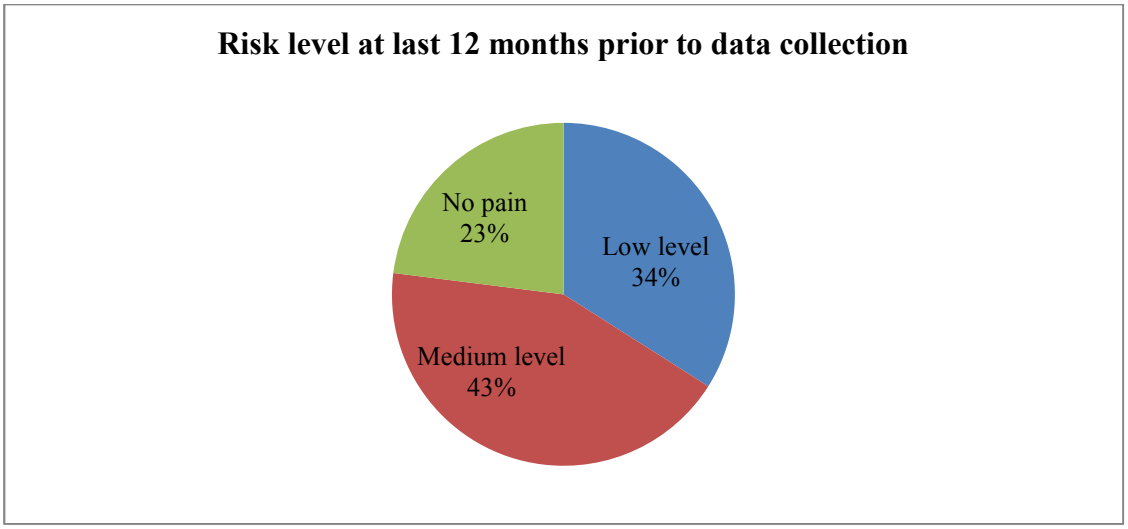

Figure 3: The Risk level of automobile mechanics at last 12 months prior to data collection

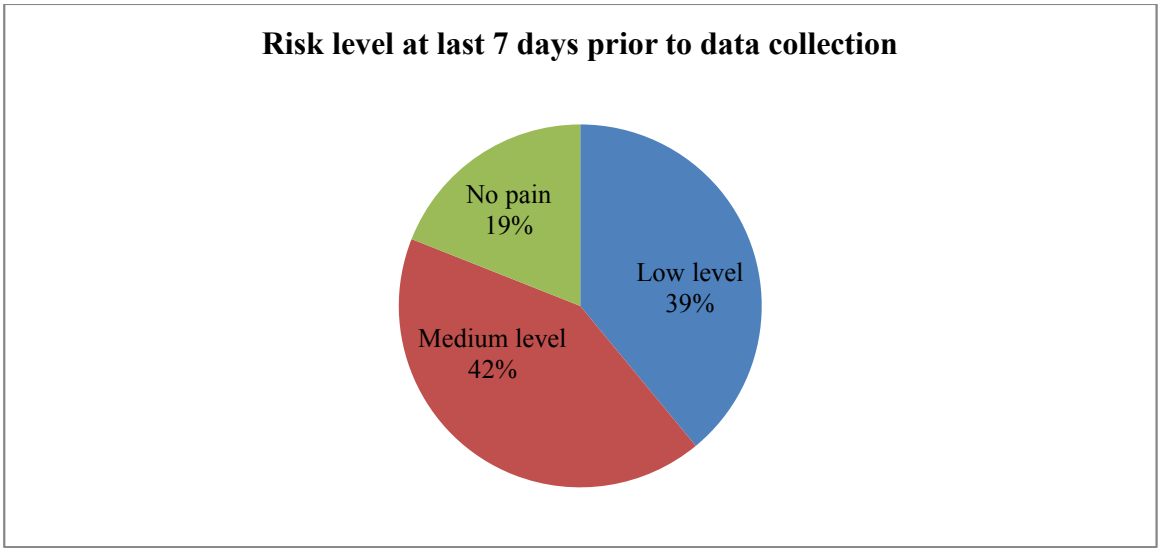

Figure 4: The Risk level of automobile mechanics at last 7 days prior to data collection

4.2.6 Association between the risk level of automobile mechanics according to REBA score and reported musculoskeletal symptoms at last 12 month & 7 days prior to data collection

REBA score	At least one region pain at last 12 months			At least one region pain at last 7 days		
	Yes (%)	No (%)	P- value	Yes (%)	No (%)	P- value
1 (Negligible)	00	00	.000	00	00	.015
2-3 (Low)	34	20		39	15	
4-7 (Medium)	43	03		42	04	
8-10 (High)	00	00		00	00	
11-15 (Very high)	00	00		00	00	

*** Chi- square test**

Table 4: Association between the risk level of automobile mechanics according to REBA score and reported musculoskeletal symptoms at last 12 month & 7 days prior to data collection

Rapid Entire Body Assessment (REBA) score also associated to develop musculoskeletal symptoms in last 12 months & 7 days (Table 4). Significant association was found between at least one region pain in last 12 months & Rapid Entire Body Assessment (REBA) score (.000) for developing musculoskeletal symptoms. And also found significant association between at least one region pain in last 7 days & Rapid Entire Body Assessment (REBA) score (.000) for developing musculoskeletal symptoms (Table 4).

4.2.7 Findings of observation

In addition to the self-reported questionnaire, the workstation of the workers had been observed using a workplace observation checklist. The working environment of automobile mechanics was disorganized, most of the times they worked in open sky. The workers were involved in awkward postures, exhibiting twisted trunks and necks and carried heavy loads more frequently.

The workers were observed standing/ sitting for prolonged periods of time more than 1 hour without taking any rest that continues for more than 8 hours and 1 hour lunch break but it was depended on pressure of work, sometimes they could not take their lunch in appropriate time due to pressure of work. They were also observed exhibiting bending, static posture, repetitive movement & force exertion. They were also observed in lifting heavy loads & using vibration tools.

CHAPTER-5: DISCUSSION

High prevalence of musculoskeletal symptoms amongst different working population is commonly reported in different study. Bangladesh is a labor intensive country. The total size of working population is about 70.86 million (Occupational Health & Safety 2010). Bangladesh has been considered as a country of high vulnerability in terms of poor occupational health outcome (Bangladesh Occupational Safety, Health and Environment Foundation 2011). In addition, scarcity of evidence in identification of risk factor responsible to develop musculoskeletal symptoms fails to take adequate steps to ensure better workplace for working population. Therefore, this study was conducted in an effort to identify the prevalence and physical risk factor among automobile mechanics.

The study found expectedly a high prevalence of musculoskeletal symptoms among automobile mechanics during their work & the most affected area was the hips in the last 7 days & 12 months. Several study in other country showed a great portion of automobile mechanics reported musculoskeletal symptoms. A cross sectional study which was done in Bergen, Norway shows that 96% of the mechanics reported that they had been troubled with pain, ache or discomfort in one or more of the ten defined parts of the body at the last 12 months. In that study the researcher selected 12 garages randomly from 25 garages and the total participants of the study were 103. In that study the researcher also found that the prevalence of musculoskeletal symptoms in the last 12 months were neck 62%, upper back 29%, lower back 76%, shoulders 52%, elbows 15%, wrists 34%, hips 20%, knees 47% & ankles 19% (Torp, Riise & Moen 1996, p. 409). In other study, Holmstrom et al. (cited in Torp, Riise & Moen 1996, p. 412) also found that 92% of the mechanics reported that they had been troubled with pain, ache or discomfort in one or more of the ten defined parts of the body at the last past 12 months which was done in Sweden. In this study the researcher selected randomly 1773 participants. In this study one-year prevalence rate of considerable neck and shoulder trouble was 56% and of neck and shoulder pain 12%. In other cross sectional study the researcher selected 461 participants was done in United Kingdom. In this study the researcher found that the prevalence of musculoskeletal symptoms in the last 12 months were neck 60%, upper back 17%,

lower back 65%, shoulders 57%, elbows 65%, wrists 46%, knees 39% & ankles 13% (Hussain 2004, p. 508). Interestingly, in this study hips pain was most prevalent musculoskeletal symptoms in automobile mechanics. Various study showed that lower back pain was the most prevalent musculoskeletal symptoms in automobile mechanics. The prevalence of lower back pain was high in Norway (Torp, Riise & Moen 1996) & United Kingdom (Hussain 2004).

In this study the investigator had found several risk factors which are associated to develop musculoskeletal symptoms. In this study the researcher found awkward posture, repetitive movement, force exertion, lifting & vibration as a risk factor. Our findings also showed a significant association between physical risk factors & at least one region pain in last 12 months & 7 days for developing musculoskeletal symptoms. Similarly, several investigators found and reported a significant relationship had present between musculoskeletal symptoms and physical risk factors such as awkward posture, repetitive movement, force exertion, lifting & vibration (Rahman, Aziz & Yusuff 2009, p. 138).

In this study the investigator observed that the automobile mechanics required great physical effort, heavy lifting and carrying, awkward posture, force exertion, vibration, repeated movement. In a study the researcher found that the automobile mechanics required great physical effort, heavy lifting and carrying, awkward posture, force exertion, vibration, repeated movement (Rahman, Aziz & Yusuff 2009, pp. 138-139). Other observations that were identified in the working environment of automobile mechanics that were the working environment of automobile mechanics were disorganized. The investigator found that the automobile mechanics worked in open sky, the working place are not well organized. Most of the time the automobile mechanics worked in sitting position at prolongs time, involved in awkward postures, exhibiting twisted trunks and necks and carried heavy loads more frequently. The workers used different apparatus during working & most of the apparatus are involved in repetitive movement. The most of the apparatus handle are not ergonomically sound or they are not used in up to date apparatus. So this might cause of musculoskeletal symptoms. The workers were observed standing/ sitting for prolonged periods of time more than 1 hour without taking any rest. Excessive sitting or standing this might cause of developing musculoskeletal symptoms.

In several studies the researcher found that the similar physical risk factors that might contribute to the development of musculoskeletal symptoms (Rahman, Aziz & Yusuff 2009, p. 137). The injuries can occur from ergonomic factors such as awkward working postures, static load and task invariability to be some of the most important risk factors for musculoskeletal symptoms (Torp, Riise & Moen 1996, p. 407). Sometimes the injuries can occur from handling heavy objects, heavy lifting, and prolonged or sustained work in awkward postures (Rahman, Aziz & Yusuff 2009, p. 137).

However, the investigator observed during data collection that they had to perform reaching activities frequently in twisted posture. This might cause problems with the soft tissue of upper and lower back and the neck often becomes fatigue and stressed (Canadian Centre for Occupational Health & Safety 2005). The investigator found in a study that the awkward posture from working with the hands above the shoulders, neck bending, bending the back forward, repeated bending and reaching during working were very common for automobile mechanics. They were frequently involved with this posture including lifting a heavy object without wearing a hand gloves and exposed to high hand arm vibration when using high impact wrench (air gun) were contributed to the ergonomic physical risk factor (Rahman, Aziz & Yusuff 2009, p. 138-139).

In this study, the investigator found that the automobile mechanics are affected by the category of low & medium level at last 12 months of musculoskeletal symptoms. In these studies, our finding also shows that the automobile mechanics are affected by the category of low & medium level at last 7 days of musculoskeletal symptoms. The investigator found that in this study, the automobile mechanics have no high risk. The possible reason for these, during observation to the automobile mechanics the investigator observed that the heavy lifting are done by other workers, their age were below 14 years or experience less than 1 year. That's why the investigator found that the automobile mechanics are affected by the category of low & medium level of musculoskeletal symptoms.

In this study, our findings showed a significant association between some socio-demographic factors & musculoskeletal symptoms at least one region pain in last 12 months & 7 days. In Bangladesh, there are many people are illiterate or received education up to the primary level. In this study the maximum people are received education up to the secondary level. Although they have received education up to the secondary level, but he has no idea about working posture, rest or taking short breaks as well as working hours. Most of the time the automobile mechanics worked prolonged time without rest or shorts break. They do not know the rest is the part of the work. The investigator also found in this study, the most of the automobile mechanics are not taking consultancy from any doctor or therapist after feelings pain or discomfort in different body regions. In a study showed that there had present association between musculoskeletal symptoms & age, employment duration (Torp, Riise & Moen 1996, p. 412). Increasing age & employment duration are known to be associated with an increasing prevalence of MSS (Torp, Riise & Moen 1996, p. 412).

CHAPTER-6: LIMITATIONS & RECOMMENDATIONS

6.1 Limitations

There are some factors limiting to the findings of this investigation. The overall sample size was relatively small & the place were selected by the convenient method & samples were chosen only two areas of Bangladesh in Dhaka. The samples were selected from those places by using convenient method. The result of the present study should be cautious to generalize.

6.2 Recommendations

A future large scale investigation of the incidence of musculoskeletal symptoms among automobile mechanics is warranted & may investigate. And also needed to identify what kinds of musculoskeletal symptoms are reported by the automobile mechanics without pain. In this study a huge number of peoples are affected by musculoskeletal symptoms, so it is necessary to prevent or improve the management of work related musculoskeletal symptoms amongst automobile mechanics.

CHAPTER-6: CONCLUSION

In Bangladesh, there is no actual information about the musculoskeletal symptoms prevalence and associated physical risk factors among the automobile mechanics. Therefore, our study aim was to identify the prevalence & associated physical risk factors of musculoskeletal symptoms among the automobile mechanics in Bangladesh. This study found a high prevalence of musculoskeletal symptoms among automobile mechanics based on their self-report measures. The majority of all respondents reported musculoskeletal symptoms in different parts of the body at last 7 days & 12 months. In these studies the most affected area was hips & others regions are affected respectively.

The automobile mechanics required great physical effort, heavy lifting and carrying, awkward posture, force exertion, vibration, repeated movement. Other observations that were identified in the working environment of automobile mechanics that were the working environment of car mechanics was disorganized. The workers were involved in awkward postures, exhibiting twisted trunks and necks, carried heavy loads, repetitive movement, force exertion & vibration tools that are potentially associated with developing musculoskeletal symptoms.

Work related musculoskeletal symptoms is a great suffering to workers physical & mental health & also impact on individuals work & leisure activities, the employee or employer who also less production. So it is important for an occupational therapist to explore their role in these areas & run different prevention programs efficiently & effectively. The government can play a vital role to decrease the rate of incidence, prevention & treatment.

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APPENDIX

Appendix 1A

Permission letter from BHPI ethical committee

Permission letter from BHPI ethical committee

Date: 10.07.13

To

The Head of the Department

Department of Occupational Therapy,

BHPI, CRP, Savar, Dhaka

Subject: **An application for seeking permission to conduct the research project.**

Sir,

I beg most respectfully to state that I am seeking permission to conduct the research project as a part of my 4th year course module. My research title is "*The prevalence & associated risk factors of musculoskeletal symptoms among car mechanics in Bangladesh*". The aim of the study is to determine the prevalence & associated physical risk factors of musculoskeletal symptoms among car mechanics in Bangladesh. Now I am seeking for your kind approval to start my research project & I would like to assure that anything of my project will not harmful for the participants.

So, I therefore, pray & hope that you would be kind enough to grant me the permission for conducting the research & will help me to conduct a successful study as a part of my course.

I remain

Sir
Mominur Rahman
Mohammad Mominur Rahman

4th year B.Sc in Occupational Therapy

Attachment: Proposal of research

Signature & comments of the Supervisor	Signature & comments of the Head of the Department
Good luck with your project 10.07.13 Shamima Akter Lecturer & Supervisor Department of Occupational Therapy BHPI, CRP, Savar, Dhaka.	It may allow to conduct the study. 13.07.13 Nazmun Nahar Assistant professor & Head of the Department Department of Occupational Therapy BHPI, CRP, Savar, Dhaka.

Appendix-2A

Dutch Musculoskeletal Questionnaire sheet

Code number:

Section-A:

Dear participant,

Your co-operation would be greatly appreciated in completing this questionnaire which aims to *determine the prevalence of musculoskeletal symptoms and their association with the demographic and physical risk factors amongst the car mechanics in Bangladesh.* You have rights to withdraw your participation & not giving any answer to the following items.

Section A: general portion

1. Age: 15-30 ☐ 31-45 ☐

2. Educational qualification

Illiterate ☐ Primary ☐ Secondary ☐

3. Job title:

Main worker ☐ Assistant ☐ Helper ☐

4. Monthly income

Less than 3000 ☐ 3001-6000 ☐ More than 6000 ☐

5. Employment duration

1 to 3 years ☐ 4 to 6 years ☐ more than 6 years ☐

6. Daily working hour:

Up to 8 hours ☐ More than 8 hours ☐

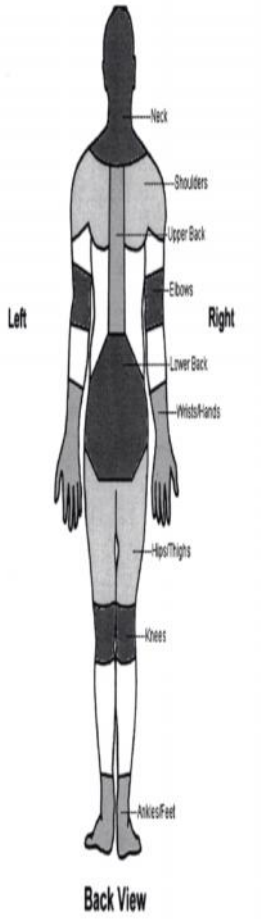
7. Have you take any sick leave due to neck pain / back pain / shoulders / elbows / wrists / hips / knees / ankles pain

Yes ☐ No ☐

8. Have you consult any doctor due to neck pain / back pain / shoulders / elbows / wrists / hips / knees / ankles pain

Yes ☐ No ☐

Section-B: Symptoms prevalence



Have you had in the past 12 months trouble (pain, discomfort) from your following body parts:

	Yes Sometimes	Yes regularly	Yes chronically	No never
Neck	☐	☐	☐	☐
Upper back	☐	☐	☐	☐
Lower back	☐	☐	☐	☐
Shoulders	☐	☐	☐	☐
Elbows	☐	☐	☐	☐
Wrists/hands	☐	☐	☐	☐
Hips/thighs	☐	☐	☐	☐
Knees	☐	☐	☐	☐
Ankles/feet	☐	☐	☐	☐

10.Have you had in the past 7 days trouble (pain, discomfort) from your following body parts::

Neck	Yes ☐	No ☐
Upper back	Yes ☐	No ☐
Lower back	Yes ☐	No ☐
Shoulders	Yes ☐	No ☐
Elbows	Yes ☐	No ☐
Wrists/hands	Yes ☐	No ☐
Hips/thighs	Yes ☐	No ☐
Knees	Yes ☐	No ☐
Ankles/feet	Yes ☐	No ☐

Signature of interviewer **Signature of witness**

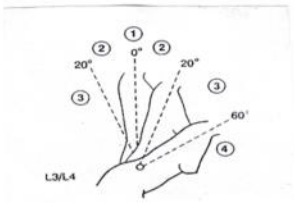
Thanks for completing the survey

Rapid Entire Body Assessment (REBA) Sheet

Code number:

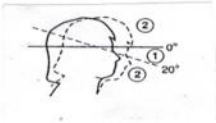
Trunk

Movement	Score
Upright	1
$0^0 - 20^0$ flexion $0^0 - 20^0$ extension	2
$20^0 - 60^0$ flexion More than 20^0 extension	3
More than 60^0 flexion	4

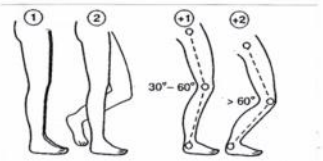


Neck

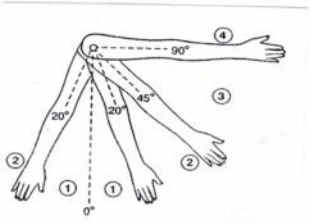
Movement	Score
$0^0 - 20^0$ flexion	1
More than 20^0 flexion More than 20^0 extension	2



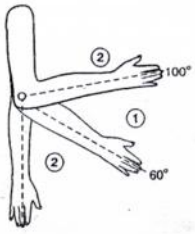
Legs

Position	Score	
Bilateral weight bearing, walking / sitting	1	
Unilateral weight bearing Feather weight bearing or an unstable posture	2	

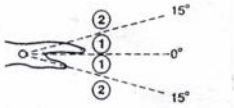
Upper arms

Position	Score	
20^0 extension to 20^0	1	
More than 20^0 extension 20^0 - 45^0 flexion	2	
45^0 - 90^0 flexion	3	
More than 90^0 flexion	4	

Lower arms

Movement	Score	
60^0 - 100^0 flexion	1	
Less than 60^0 flexion More than 100^0 flexion	2	

Wrists

Movement	Score	
$0^0 – 15^0$ flexion $0^0 – 15^0$ extension	1	
More than 15^0 flexion More than 15^0 extension	2	

REBA scoring sheet

Group A	**Group B**
Trunk ,Neck ,Legs = Table A+ load/Force= Score A	Upper arms, Lower arms, Wrists= Table B+ coupling score= Score B
Score C (Using table C) Score C+ Activity score= REBE score	

Appendix-2C

Observation checklist based on DMQ

Section-C:

Risk activities	Yes, if yes then describe	No
1) lift/ pull or push/ carry heavy loads		
2) awkward posture with twisted trunk		
3) awkward posture with a heavy load		
4) stand/ sit/walk/ stoop for a prolonged time		
5) bent/ twist slightly/ heavily with trunk		
6) hold arm above shoulder level		
7) occur repetitive movement in trunk, neck, wrists		
8) make small movements with hands/fingers at a high workplace		
9) twist neck		
10) hold neck in a forward bent posture for a prolonged time		
11) hold neck in a twisted posture for a prolonged time		
12) hold wrist bent/ twisted for a prolonged time		
13) always make the same movements with trunk/ wrists/ legs/arm		
14) difficulty in exerting force because of		

uncomfortable postures

15) may they use in vibration tools

16) Do the workplace is organized

Appendix-3A

Appendix-3A

তথ্য সম্পর্কিত পত্র

কোড নাম্বারঃ

আসসালামুআলাইকুম,

আমি মোহাম্মদ মমিনুর রহমান, বাংলাদেশ হেল্‌থ প্রফেশনস্ ইনষ্টিটিউট (বিএইচপিআই) এ বিএসসি ইন অকুপেশনাল থেরাপী এর ৪র্থ বর্ষের একজন নিয়মিত ছাত্র। বাংলাদেশ হেল্‌থ প্রফেশনস্ ইনষ্টিটিউট (বিএইচপিআই) হচ্ছে পক্ষাঘাত গ্রস্থদের পুনর্বাসন কেন্দ্র (সি.আর.পি) এর একটি শিক্ষা প্রতিষ্ঠান, যা ঢাকা বিশ্ববিদ্যালয়ের অধিনস্থ। কোর্স কারিকুলাম অনুসারে স্নাতক পর্যায়ের আংশিক সমাপ্তির উদ্দেশ্যে আমি "বাংলাদেশের গাড়ি মিস্ত্রীদের পেশী ও অস্থি সম্বন্ধীয় সমস্যার হার এবং কাজের ঝুঁকিসমূহ" উক্ত শিরোনামে একটি গবেষণা করছি । গবেষণার লক্ষ্য হচ্ছে গাড়ি মিস্ত্রীদের পেশী ও অস্থি সম্বন্ধীয় সমস্যার হার নির্ধারণ এবং আর্থসামাজিক ও কাজের ঝুঁকিসমূহ খুঁজে বের করা এবং ঝুঁকিসমূহের সাথে সমস্যার হারের সম্পর্ক নির্ধারণ।

এই জন্য আপনাকে, কতগুলো প্রশ্ন জিজ্ঞাসা করা হবে এবং কাজের সময় আপনাকে পর্যবেক্ষণ করা হবে। আপনার দেয়া সব তথ্য গোপন রাখা হবে এবং যদি প্রকাশনার কাজে ব্যবহার করা হয় তাহলেও নামহীন ভাবে প্রকাশ করা হবে। সাক্ষাৎকার চলাকালীন সময়, কোন প্রশ্ন অপছন্দ করা কিংবা উত্তর না দেয়ার ব্যাপারে আপনার পূর্ণ অধিকার রয়েছে ।

আমি আরও জানাচ্ছি যে, যেকোন সময় আপনি গবেষণায় অংশগ্রহন প্রত্যাহার করতে পারেন। এই গবেষণা আপনাকে সরাসরি কোন সাহায্য করবে না এবং এটা জেনেই আপনি গবেষণায় স্বেচ্ছাই অংশগ্রহন করছেন।

অংশগ্রহনকারী হিসেবে এই অধ্যায়ন নিয়ে আপনার কোন সংশয় বা প্রশ্ন থাকলে আমাকে জিজ্ঞাসা করতে পারেন। আমি এই অধ্যায়ন সম্পর্কিত সকল প্রশ্নের উত্তর দিতে বাধ্য থাকিব।

মমিনুর রহমান

মোহাম্মদ মমিনুর রহমান

চতুর্থ বর্ষ, বিএসসি ইন অকুপেশনাল থেরাপী

ডিপার্টমেন্ট অফ অকুপেশনাল থেরাপী

বাংলাদেশ হেল্‌থ প্রফেশনস্ ইন্সিটিউট (বিএইচপিআই)

সি.আর.পি, চাপাইন, সাভার, ঢাকা-১৩৪৩

অনুমতি পত্র

এই গবেষণায় আমি ..... একজন অংশগ্রহণকারী এবং এই গবেষণার উদ্দেশ্য পরিষ্কারভাবে জানতে পেরেছি। আমি যে কোন সময় এবং গবেষণার যে কোন পর্যায়ে আমার অংশগ্রহণ প্রত্যাহার করতে পারি। এই জন্য আমি কারও কাছে জবাবদিহি এবং ক্ষতিপূরণ দিতে বাধ্য নই।

সাক্ষাৎকারের সকল তথ্য যে গুলো গবেষণার কাজে ব্যবহৃত হবে, সেগুলো গোপনীয়তার সাথে নিরাপদ স্থানে রাখা হবে। শুধুমাত্র গবেষক এ তথ্য গুলোর প্রবেশাধিকার পাবে এবং কারও নাম কোথাও না ছাপিয়ে এ তথ্য গুলো গবেষণা পত্রে প্রকাশিত হবে।

আমি উপরোক্ত সকল তথ্য সম্পর্কে জানি এবং আমি এই গবেষণায় অংশগ্রহণে সম্মতি জ্ঞাপন করছি।

অংশগ্রহণকারীর টিপসই অথবা স্বাক্ষরঃ..... তারিখঃ.....

গবেষকের স্বাক্ষরঃ ..... তারিখঃ.....

Appendix-4A

Permission letter from the author of DMQ

Dear Md. Mominur Rahman,

I give permission to use the DMQ for your dissertation. I wish you success!

Kind regards,

Vincent

Dr. V.H. (incent) Hildebrandt
Sr Research Scientist / team coordinator
Expertise Centre LifeStyle
T +31 (0)88 866 62 24
M +31 (0)65 280 35 54
E vincent.hildebrandt@tno.nl
Locatie
Disclaimer

Appendix-4B

Permission letter from the author of REBA

Dear Mominur,

You are welcome to use REBA and I hope your project is very successful!

You can find an online version at the Cornell University ergonomics site.

Regards,

Lynn

Lynn McAtamney, PhD

Ergonomics, Resilience and Mental Health Lead
Health Safety and Wellbeing | Human Resources
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