Journal of Social Sciences Review (JSSR) DOI: https://doi.org/10.54183/jssr.v3i2.274

How to Cite This Article: Anwar, S., Khurshid, S., Nasar, L., & Parveen, A. (2023). Association between Organizational, Biomechanical, Hard Physical and Psychosocial Risk Factors and Job-related Musculoskeletal Problem Disorder: A Systematic Literature Review. *Journal of Social Sciences Review*, 3(2), 356-371. https://doi.org/10.54183/jssr.v3i2.274

Association between Organizational, Biomechanical, Hard Physical and Psychosocial Risk Factors and Job-related Musculoskeletal Problem Disorder: A Systematic Literature Review

Sofia Anwar	Dean, Faculty of Economics and Management Sciences, GC University, Faisalabad, Punjab, Pakistan.
Saima Khurshid	PhD Scholar, GC University, Faisalabad, Punjab, Pakistan.
Lubna Nasar	PhD Scholar, GC University, Faisalabad, Punjab, Pakistan.
Asia Parveen	Lecturer, Department of Business Administration, Govt. College Women University Faisalabad, Pubjab, Pakistan.

Vol. 3, **No.** 2 (Spring 2023)

Pages: 356 – 371

ISSN (Print): 2789-441X

ISSN (Online): 2789-4428

Key Words

Ergonomics Risk Factors, Organizational Risk Factors, Biomechanical Risk Factors, Psychosocial Risk Factors, Musculoskeletal Problem Disorder

Corresponding Author:

Sofia Anwar
Email: drsofia.economist@gmail.com

Abstract: *Basic aim of this systematic review paper is to overview the ergonomics risk factors associated with jobs and enumerate the associations between risk factors such as organizational, psychosocial, biomechanical, hard physical job risk factor and work-related musculoskeletal problems. PRISMA methodology for paper selection is adopted and selects 103 papers from springer and Elsevier, published during 2001 to 2021. Books and review papers are excluded from the review. Ergonomics risk factors of MPD issues such as palm pain, hand-wrist pain, arm pain, shoulder stretching and pain, neck pain, lower back pain, back bent, knee pain and foot pain among the workers of various industries. Out of 103 studies, link between WMPD and biomechanical risk factors is 30%, with psychosocial risk factors is 30%, with organizational risk factors is 26% and with physical job is 14%. As review indicates the association of ergonomic risk factors with work related MPD. There must be ergonomic interventions to overcome these MPD issues. Training and exercises must be guided to employees. Correct posture, sitting and standing positions to avoid associated job risk must be communicated to employees. There must be effective communication among employees and management to take an effective decision to resolve ergonomic risk factors associated with jobs.*

Jell ode classification: D20, F64, E71, and I10

Introduction

Normally the concept of ergonomics refers to humans and their jobs. It is concerned with behaviors, psychosocial, and other factors of humans in performing their job. It defines the limitations and comfort criteria for human beings to perform a secure job. The basic purpose of ergonomics is to remove the hurdles in performing quality work and safety of employees. Various ergonomic risk factors as Biomechanical, psychosocial, organizational and hard physical factors, create various musculoskeletal issues which prevent the employees to perform their job with comfort also create health related problems. Ergonomics deals with risk factors assessment and designing a job, tools and sitting equipment in such a manner to prevent employees from various physical injuries. Various researchers defined ergonomics in the following manner.

Authors	Definition of Ergonomics
(Te-Hsin and Kleiner 2001)	Ergonomics is a combination of the words ergo, a Greek word meaning "work" meaning "study" - the study of work. An applied science that co-ordinates the design of devices, systems and physical working conditions with the capacities and requirements of the workers
(Tayyari and Smith, 1997)	A branch of science that is concerned with the achievement of optimal relationships between workers and their work environment
Brooks et al	A system of interacting components which includes the worker, the work environment both physical and organizational, the task and the workspace

Following are different ergonomic risk factors:

Biomechanical risk factors

These factors are associated with the working environment provided to employees. How much the workplace is peaceful or noisy and which factors affects the comfort-ness of the employees?

Psychosocial Risk Factors

It indicates the interactions between management and employees. How much stress is faced by employees may be emotional stress or work stress?

Hard Physical Job Risk Factors

This type of risk arises when employees have to lift weights; force exertion is more demanded in performing a job.

Organizational Risk Factors

Organizational risk factors associated with the terms and conditions of work, working hours in a day, rest breaks and job's time etc.

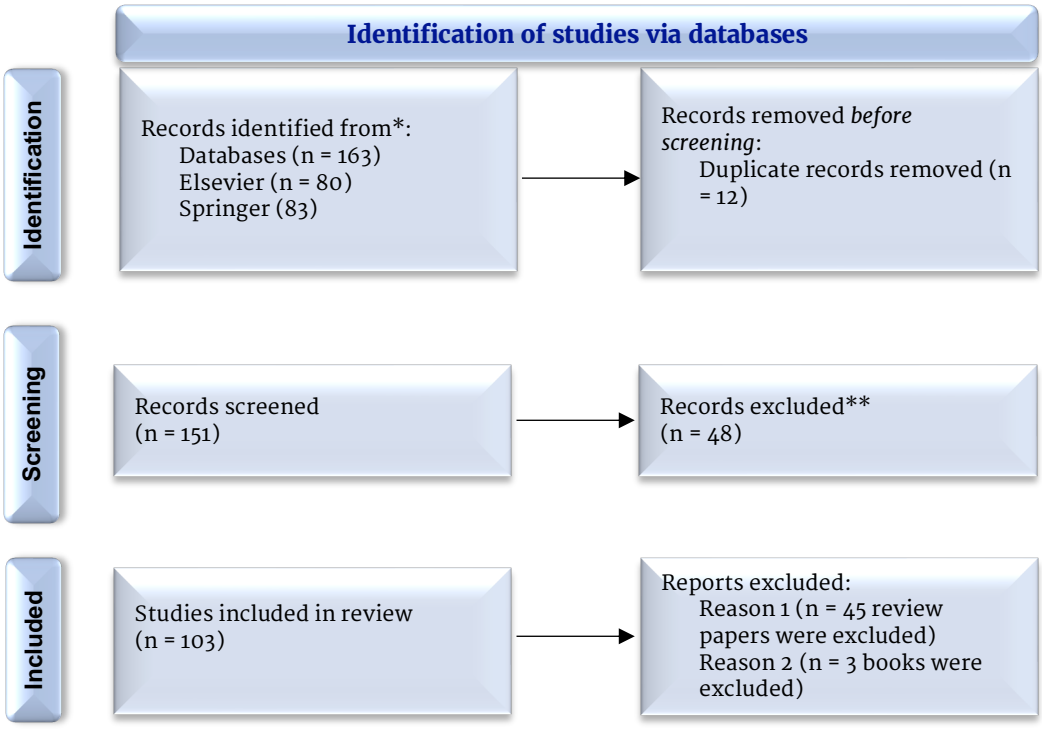
Systematic Literature Review

To explore the link between ergonomic risk factors and jobs, the Systematic literature review is studied through PRISMA framework.

PRISMA Flow Diagram

Figure 1

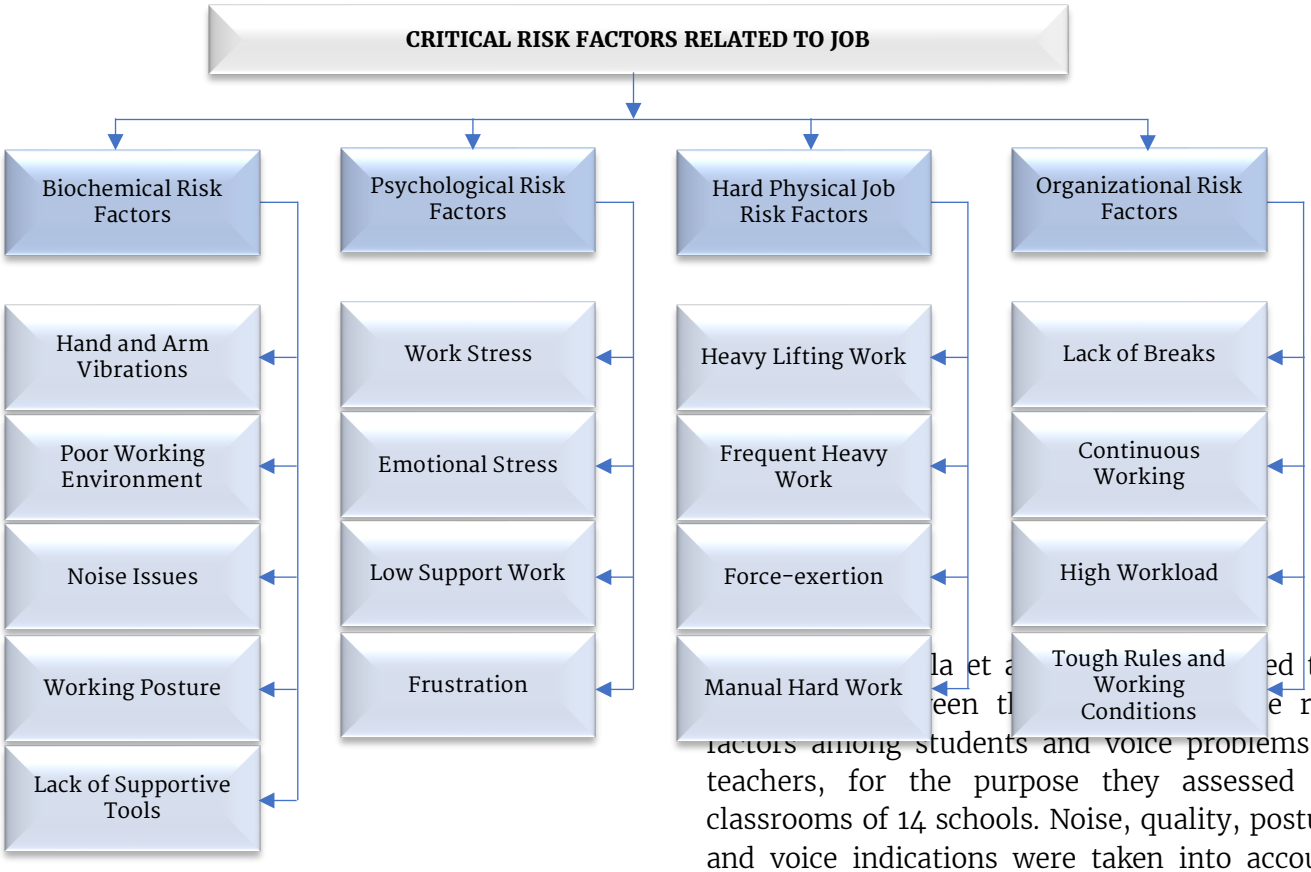
PRISMA flow diagram



The literature is studies and divided into 4 categories as literature is full with 4 major critical risk factors related to jobs.

Figure 2

Critical Risk Factors Associated to jobs.



Biomechanical risk factors/Physical Risk Factors

(Sonja Pavlovic Veselinovic et al, 2015) developed SONIC (Computer based expert system) to analyze the ergonomic facts at different job places and generate 140 simple questions on the basis of different modules related to the symptoms of body part and related to the work place environment like work chair and working tools etc. and was taken answers from 500 observations and study concluded that employees at job place suffering the risk factors associated to musculoskeletal disorders. (T. Sakthi Nagaraj et al, 2019) investigated the ergonomics risk factors related to the working conditions in Sri Lanka for standing sewing machine operators, that leads workers toward discomfort and musculoskeletal syndromes. la et a ed the een th e risk factors among students and voice problems in teachers, for the purpose they assessed 39 classrooms of 14 schools. Noise, quality, posture and voice indications were taken into account completely. They concluded there was a high correlation between voice symptoms and voice risk factors; stress also affects the voice quality. It must be encountered by school management to improve the voice quality system to manage the ergonomic, noise risk factors. (Ishwarya and Rajkumar, 2020) select 5 construction sites and take data from management as well as from employees to know the viewpoints before designing ergonomics tools. During this survey, awkward postures were noticed like the posture of back bent and twisted back portrayed the Ergonomics risk factors at construction sites. In assembly lines, to increase production, high burden is on workers as well as some risk factors like musculoskeletal disorder can be observed in employees of assembly lines due to repetition of work (G. Mossa, 2015).

It was explored that heavy loads and postures also affect the workers' health. To analyze the ergonomic risk factors at job places they examined the ways to amend at job places to reduce the musculoskeletal pain, awkward postures in assembly line jobs. During their survey they observed if job rotation is implemented the musculoskeletal pain related risk factors can be minimized (Alena and Olga, 2017). 3003 respondents were randomly selected by (Baiduri Widanarko et al, 2012). To analyze the lower back symptoms among workers in New Zealand, data was collected through telephone calls. Study indicated that tiring and awkward positions of employees become a cause of absenteeism. (Dimate-Garcia and Rodriguez-Romero, 2021) claimed that musculoskeletal disorder affect the students and for this purpose they analyzed the risk factors associated with postgraduate students and 304 graduate college students were randomly selected and it was detected that students were suffering with symptoms of neck, eye, stretching, shoulders, elbows, hand-wrist, back pain, upper and lower limb. These issues were detected due to the usage of laptops, and working without the support of any table etc. (Sourabh Kulkarni, 2019) investigated the risk factors related to the foundry workers in India, data was collected through Nordic musculoskeletal questionnaire.

Data was observed from 181 male foundry workers and logistic regression analysis were applied and results indicated lower back, neck and knee problems due to the inconvenient working environment. (Ling lei et al, 2005) investigated the ergonomic risk factors among foundry workers in China. Study was based on 617 foundry workers who responded through Nordic questionnaires and reported low back disorder symptoms among workers due to lifting and using vibrating tools. (Iman Dianat et al, 2015) suggested the ergonomic risk factors among sewing machine operators in Iran and for the aim 251 SMOs were selected and reported their responses through a Nordic questionnaire. RULA methods were used to analyze the risk factors. The results found musculoskeletal symptoms such as neck, shoulder, back, hand and wrist were found due to the working environment and standing position during their work. (Kari Babski-Reeves et al, 2005) explained 33% of VDT operators reported annual back and neck pain. Due to this, ergonomic chairs were developed. The study was conducted to know the effect of chair types and monitors on the health of operators. Results indicated that human body is significantly influenced by the types of monitor and chair. At the same time, posture issues due to body discomfort are reported by respondents. (Robert A. Warner et al, 2010) accompanied a study in automobile assembling sites to assess the biographic and demographic risk factors associated with the worker's health. Data from 3169 nurses was taken to analyze the risk factors associated with their jobs, study indicated nurses were suffering with MPD, low back pain, neck pain, shoulder pain and health issues due to the physical factors at their job places. Pushing, pulling and turning the patients with hands and arms lead them toward MPD (Ellen boss et al, 2007). Neck bent postures at job places indicated neck pain disorder among computer users (B. Cagnie et al, 2007). Clerical staff and organizational workers were observed for carpal tunnel syndromes. Results showed that work of peak force level at jobs was the major reason for hand pressure, pain and CTS among employees (Nancy Gell et al, 2005). 4500 Computer users in IT departments of India were investigated and 22 % workers were suffering issues due to the work styles, 63% employees were indicated with Pain due to the pressure/deadlines and lack of breaks during their work (Deepak (Sharan et al, 2011). Work load, discomfort, working conditions and work environment is explored as a reason for early retirements of employees (Eero Lahelma et al, 2012). CTS were assessed among female cashier employees of supermarkets. Results indicated repeating of work creates, CTS issues, pain in at least first three fingers and wrist to palm pain (Roberta Bonfiglioli et al, 2007). Dental students were observed by (Rajani A. Dable et al,

2013). Ergonomic posture risk factors and discomfort environment caused MPD among dental students. (Esmaielzadeh, Ozcan and capan, 2012) investigated MPD among computer workers due to the postures and physical risk factors associated with their work.

Psychosocial Stressors Risk Factors

Computer usage and tools related to computers like mouse, keyboard, telephone and chair etc. could be the reason for discomfort in office. So to identify the risk factors associated with computer work in offices (Mishael Sonne et al, 2011) studied 72 work stations and concluded that using of computers and wrong positions caused total body discomfort level. Hi-tech industries were analyzed in respect of ergonomics risk factors by (Shuval and Donchin, 2005). Data of 84 workers was taken into account, including programmers, managers and marketing officials. They investigated through RULA and concluded employees were under pressure of hectic time routine and it resulted in wrist, fingers and hand issues related to the arms. Neck and shoulders issues were also prevailing among employees from the last 2 years in hi-tech industries, specifically where employees are working for 10 hours in a day. The ergonomics risk factors are also associated in the working of video display terminal operators (VDT). Ergonomic risk factors were analyzed by (Foglemen and lewis, 2002).

For the aim, they sent their questionnaires for survey to 373 observant and out of these only 78% which indicated as 292 responses were caught back, according to the survey, the risk related to discomfort increases statistically significantly within increase the number of hour usage of keyboard and screen times. Also the position of the monitor and screen affected the eyes, head, shoulder and back. (Alireza Choobineh, 2011) described that musculoskeletal disorder occurs due to physical risk factors but also because of psychosocial risk factors among employees. They also described how ergonomics interventions influence musculoskeletal disorders and discomfort-ness among employees in office. For the purpose they selected 73 employees as a case and 61 office employees as a control group. These members were selected randomly. Data was collected through a Nordic musculoskeletal questionnaire and it was observed in 28.8 % of employees that low back pain was the major issue. Musculoskeletal issues were reported from the employees in office work, including upper back, lower back and ankle/foot pain.

(Holcroft and punnett, 2009) claimed risk factors prevailing among wood processing workers, they also claimed injuries associated with their hard and tough work. To analyze these factors they selected 157 cases which were given compensation for being injured and the remaining 251 controlled interviewed to collect the required data. Major injuries were due to lack of training and overburden. 763 workers were randomly selected by (Xiaoqi chen et al, 2018) to analyze the link between psychosocial risk factors and neck pain. Results indicated that employees working in the office for more than 6 hours in a day are significantly associated with neck pain. A study was started by (Kiook Baek et al, 2017) to explore work related psychosocial risk factors which were assessed among emotional labors. For the purpose of study 3979 participants were selected and collected data from them. It was concluded that employees who were satisfied with their jobs were involved in major issues of musculoskeletal pain. A research study was conducted by (M. Massaccesi, 2003), on truck drivers to find the ergonomic risk factors. 77 truck drivers of rubbish-collection vehicles were selected as a sample of study, who sits in a standard position. They were analyzed with RULA technique. Results of study indicated the significant link between risk factors that affect the neck, upper limb disorder, bending and twisting issues. Due to more time spent on driving. A study was conducted on truck assembly plants by (Mohsen zare et al, 2015) to assess the risk factors among workers doing hard jobs on plant. The plant is categorized in 2 types,

1st complete it's circle, in 8 minutes and another, in 11 minutes.

To assess the Psychosocial and physical factors, a questionnaire was developed and respondents reported that musculoskeletal disorder prevailing among workers. At the same time, the study reported that there is no differentiation in results of both types of organizations. (Kristel Oha et al, 2014) indicated psychosocial risk factors among computer users that results in musculoskeletal issues. A survey was conducted to observe psychosocial risk factors in terms of time pressures, intense work and stress of jobs, related to their jobs. Survey indicated the MPD issues among the hotel workers. 617 cases of home care workers, who were near to receive the pension and 771 workers were still working. Responses from the respondents indicated time pressure, poor caring techniques, decrease in lifting tools, less support from Organizations, leads them toward the (MPD Lotta delve et al, 2003). (Ellen boss et al, 2007) found that nurses were suffering with MPD, neck and back pain due to the lack of support from their supervisors and administration and repetition of work. Individual, physical and psychosocial risk factors from 512 computer users were observed who were suffering from neck pain. Psychosocial risk factors like, lack of staff, similar per minute movement and consistent working were indicated as the major reasons for neck pain (B. Cagnie et al, 2007). (Shahla Eltayeb et al, 2009) neck pain, shoulder's pain, forearms and hand pain complaints were observed due to the physical and psychosocial risk factors among the 264 computer users.

Psychosocial risk factors were observed among school children and results indicated students suffer shoulder and neck pain due to stress (Elham Gheysvandi et al, 2019). Psychosocial risk factors were observed among employees and became the reason for early retirements (Eero Lahelma et al, 2012). Psychosocial factors were associated with jobs of hospital nurses who suffered shoulder, neck and back pain due to stress, discomfort, and low breaks during working (Evangelos C and Alex Burdorf et al, 2003). Psychosocial factors were proven the reason for MPD, lower upper back pain, shoulder pain, neck pain, hand pain and elbows of computer office workers (Gintarekaliniene et al, 2016). Psychosocial risk factors were observed as a reason for MPD among 2000 office workers. Shoulder, elbow, wrist and hand issues were observed among office workers (Prawit Janwantanakul et al, 2009). The data from 100 school teachers was taken by (Thomas T.W. Chiu and Peggo K.W. lam, 2006) to analyze the psychosocial ergonomic risk factors associated with their work. Study indicated neck and upper limb pain among workers.

Hard Physical Jobs related Risk Factors

Ergonomics risk factors were identified by (Forde and Buchholz, 2004), in the construction ironwork industry among employees. Special task activity based analysis (STBA) was conducted to investigate qualitative analysis from 13821 workers. The STBA method was based on PATH analysis which showed (posture, activity, tools and handling), the non-neutral posture of trunk, arms and leg issues due to hard jobs of employees. . Due to physical jobs, especially in the forest, the health of employees suffers. A study was conducted by (Enez and Nalbantoglu, 2019), to investigate the ergonomic risk factors prevailing in forestry at the step of logging harvesting, skidding and loading of heavy weights. They analyzed the posture of employees while working in forestry and it was statistically concluded that there were significant ergonomics risk factors associated with postures of employees. The rubber tappers have to cut the trees in a way to get the milky fluid which is the natural source of getting rubber. Job of rubber tappers was investigated by (Supaporn Meksawi et al, 2011). They find out the risk factors through questionnaires that extensive musculoskeletal problems as, wrist, arm, lower back, shoulder, legs, neck pain among workers due to the twisting, back bending positions and also due to

the requirements of hard job. In the airline maintenance industry, high risk of injuries is associated with hard jobs. (Hamed Asadi et al, 2019) conducted three kinds of analysis, including subject matrixes, posture and lifting analysis. They collected the required data from 235 sample employees who were involved in 5 kinds or working areas as aviation, repair and overhauling to measure the ergonomics risk factors. Responses from Nordic Musculoskeletal indicated low back pain and aches were the major issue. Knees were associated with high risk in cabin maintenance. Ergonomics interventions are necessary to overcome from risky situations in the aircraft maintenance industry due to tough and hectic jobs.

(Marie-Eve- Chiasson et al, 2014) investigated hard job risk factors and compared the workers with and without suffering musculoskeletal pain before 7 days of data collection. They collected data from employees of three industries as appliances, plastic and tree nursery industries. 473 workers were included in assessment. They concluded significant musculoskeletal pain suffering among workers in both groups. Jobs at construction sites are harder as compared to other industrial jobs. Within the passage of time hard jobs become the reasons of injuries and musculoskeletal disorder in workers. (Nipun D. Nath et al, 2017) conducted a study on construction site workers and found that awkward postures are ergonomic significant risk factors and results in, trunk and shoulder injuries. (Prakash kumar et al, 2016) conducted a study in a small fruit processing unit where workers were engaged in pineapple peeling activities, they explored the ergonomic risk factor associated with these peeling activities in India. RULA was used to assess the ergonomic risk factors and data were collected through questionnaires based interviews to find the prevailing risk factors. Results of study reported, that workers were suffering from the musculoskeletal disorder with mention rates, 41% (shoulder pain), 37% (upper arms pain) and lower back pain (45%). Neck, lower arms, wrists and palms were also indicated issues in RULA analysis. The manual working pineapple peeling contained several risk factors. Study also directed that the situation could be improved by rotation of shoes during work. (Baiduri Widanarko et al, 2014) incorporated a study to assess the ergonomic, environmental, psychosocial and physical factors and they interviewed 3003 workers in New Zealand and took data. Multivariable logistic regression analysis was conducted in this study. Study concluded neck, shoulder, arm, elbows and low back issues among workers.

(Pieter coenen et al, 2012) investigated that mechanical workers were noticed with physical risk factors like lifting, low back pain and body vibrations. (Catarina Nordarden et al, 2008)Employees from rubber manufacturing and plant assembly lines were observed and showed that females influenced more physical hard job risk factors as compared to the male. Hands, elbow, arms, neck, and shoulder pain was assessed more in females as compared to males.

Organizational Risk Factors

(Hsin-yi kathy cheng et al, 2012) investigated risk factors related to educators while educating the children, it is important to understand that in early stages how educators manage with risk factors associated with their profession. To analyze the musculoskeletal disorder among educators a questionnaire was developed and analyzed symptoms of lower back pain, shoulder and neck issues. (Bhawana Rathore et al, 2020) investigated about musculoskeletal disorders prevailing among workers of glass art ware. And they studied the Indian glass art-ware industry and through rapid entire body assessment (REBA) data, related to discomfort of employees in glass art-ware industry was collected through questionnaires. They applied multiple logistic models and concluded that there was high prevailing rates of back, thigh and foot pain among glass art ware workers, 2nd the study

showed high rate of risk was associated with posture during the working. Musculoskeletal indications were highly prevalent in the glass art ware industry of India. The hairstylists have to do major work with their arms, hands, fingers and wrist, the position and angles of wrist and arm might be affected at the job place. So to identify the ergonomics risk factors associated with work of hairstylists, (Hsieh-ching Chen et al, 2009) were assessed the wrist angles of 21 hairstylists, for study they divided the sample into 2 groups as male hairdressing experts and female hairdressing experts. 11 numbers from 21 belongs to 1st group and remaining 10 belongs to 2nd group. The activities related to hairdressing are divided into three categories, washing, cutting and hair blowing. During experiments it was observed that the hairdressing of males, takes less time as compared to the hairdressing of a female, so it was indicated that there is a high association of ergonomic risk factors toward the wrist or arm pain.

(Chaikieng and Suggaravetsiri, 2015) analyzed the ergonomics risk factors involved in dental proceedings during their filling and scaling task. The study included 193 dentists and dental nurses from government hospitals in Thailand. The data was collected from hospitals through surveys. Results showed while performing scaling and filling tasks, ergonomic risk factors are almost 78 % associated. Back pain was the major issue during working. Somehow a combination of three as neck, shoulder and back pain were reported by dentists during scaling and filling tasks. The study suggested that hospitals should provide working tools designed ergonomically at hospitals to fit for the dental working. (Ali Sheikhzadeh et al, 2008) studied the ergonomic risk factors associated with nurses and technicians in operation theaters and working environments, they determined the lower back pain and ankle pain as the major reason of absenteeism at the job place, and simple engineering solutions suggested overcoming the situation. Nordic musculoskeletal questionnaire was designed by (Andrew M.Scuffham et al, 2010) to understand the ergonomic risk factors, which were prevailing in occupation of clinical veterinarians. They collected data from 867 veterinarians in New Zealand. Veterinarians were asked about the presence or absence of musculoskeletal pain. 18% of employees were absent from their jobs due to the musculoskeletal pain, lower-back pain was noted. The awkward hand movement and grip was the major issue of musculoskeletal disorder. The aim of the study conducted by (Iman dianat et al, 2018) was to assess the physical and occupational risk among the surgeons in Iran. Data was collected from 312 surgeons and analyzed the multivariate logistic regression analysis. The results were reported as significant presence of risk factors like, knees, neck, low back and shoulders among surgeons, especially those who work by standing till 5 hours per week or 4 hours per day, were more influenced with these Musculoskeletal disorder issues.

To analyze the risk factors associated with working of nurses, Nordic questionnaire was designed to collect data from Japanese nurses by (Derek R. Smith et al, 2006). 844 questionnaires were completed by respondents and were analyzed by researchers. They concluded more than 70% respondents were claim shoulders, lower-back, neck, and upper back problems in them. The conditions of the dental students, they were trained and educated in the dental environment and many risk factors also associated toward the dental students, so there must be ergonomic preventions adopted by students, (Linda j. Thornton et al, 2004). A study was conducted by (Liyun yang et al, 2020) for the purpose of assessment of risk factors, specifically musculoskeletal disorder faced by surgeons. For the aim the data was collected from 116 cases of surgical specialties. The respondents showed results that surgeons felt pain in neck, upper and lower back, mostly during and after any operation. Musculoskeletal disorder is a common issue among surgeons. (Seyedtaghi Mirmohammadi et al, 2015) conducted a study to identify work related risk factors. They started

the study to undertake risk factors faced by hospital health care staff, for that from public hospitals, data of 110 respondents was collected and results of study presented the significant relation with neck pain and back pain. (Burnett and campbell-kyureghyan, 2010) incorporated a study to find the risk of injuries and musculoskeletal disorders among medical sonographers, during their work. 86 % of respondents acknowledged upper extremity musculoskeletal pain.

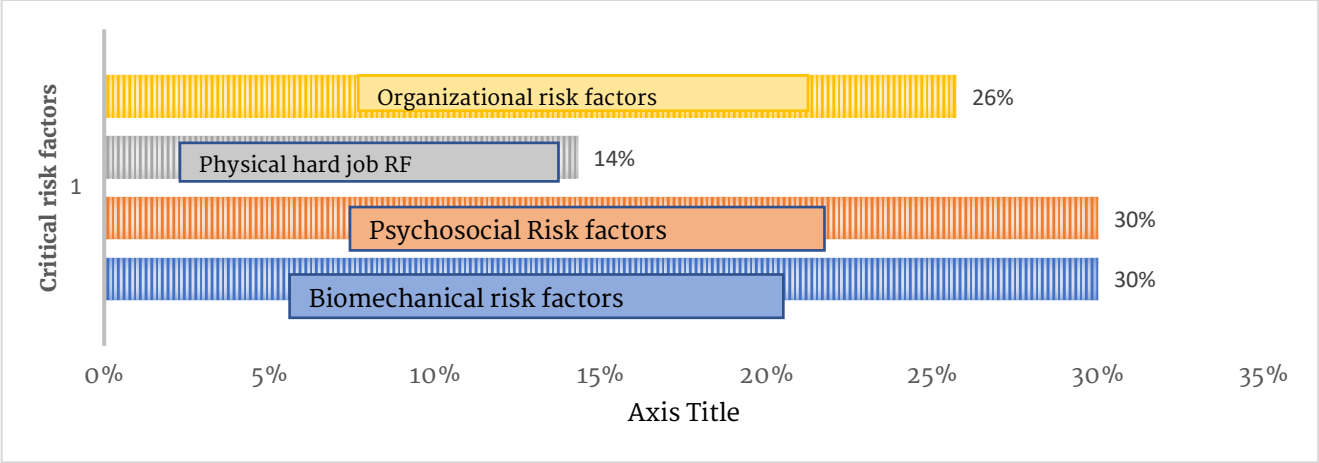
Low back pain was indicated among nursing staff, due to their profession in Taiwan. (Chao-kang Feng et al, 2007). In Estonia occupational usage of computers is increased which results in musculoskeletal disorder (Kristel Oha et al, 2014). The position of hands of surgeons was assessed during laparoscopic instrument use and it was indicated that this position can cause wrist pain. Continuous doing the same work without having rest results in MPD (M.sanchez-Margallo et al, 2010). 400 industrial workers were analyzed through questionnaires and concluded that force exertion, twisting hands and rapid movements of hands, consequence the CTS issues among employees, (Maryam maghsodipour et al, 2008). Special educators were observed with shoulder pain, lower-back pain and wrist pain due to risk factors associated to their types of duties, including diaper changing etc. By using supportive tools at jobs, MPD issues can be minimized, (Hsin-yi kathy cheng et al, 2016). 205 Physiotherapists were observed by (Yesim salik and ayse ozcan et al, 2004) and found lower-back, hand-wrist, shoulder, neck and lower-back pain due to job related risk factors. Through a questionnaire, data was collected from University staff. It was observed they were suffering neck pain due to their profession and the percentage of neck pain was more in female lecturers than male lecturers (T.T.W chiu, 2002). Office workers were observed by (Maaike A et al, 2012). They investigated computer work could lead toward the hand, arms, wrist, shoulders and neck pain issues among employees.

Musculoskeletal Pain Disorder (MPD)

The Musculoskeletal problem is one of the major health issue deals in Ergonomics. Musculoskeletal pain disorder is observed in literature and brings, Trunk, neck pain, shoulder pain, posture, leg pain, arms pain, wrist pain, palm pain, back bent, back pain, lower back pain, foot/ankle pain, knee pain, and physical injuries. These issues occurred through the following ergonomics risk factors.

Figure 3

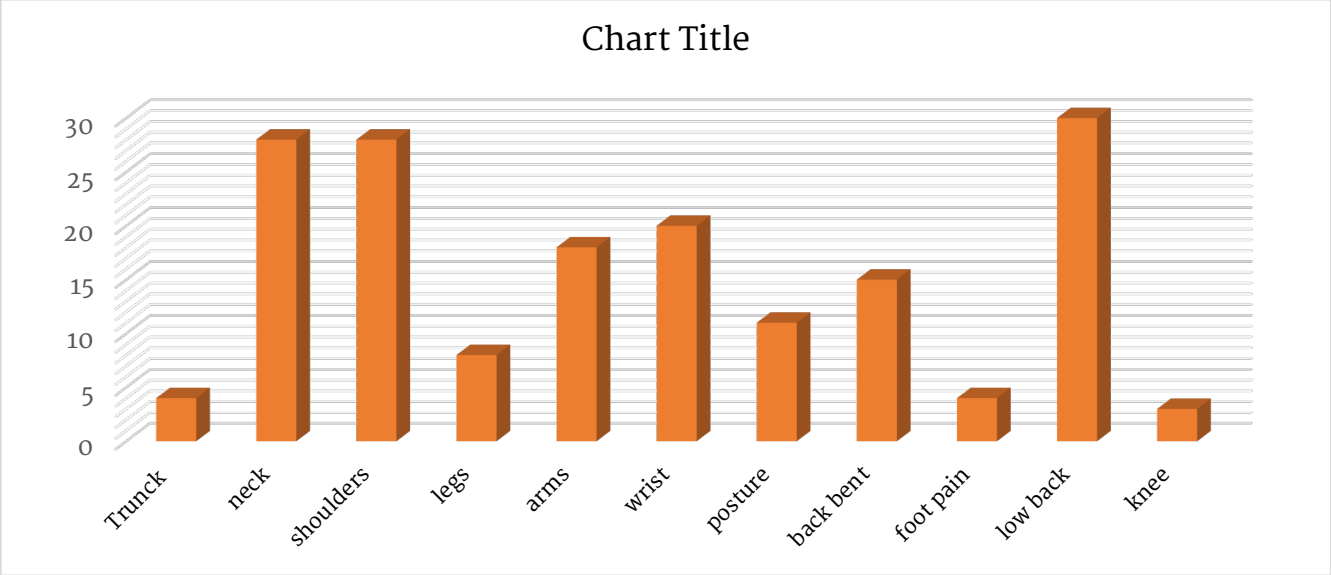
In SLR Critical risk factors association with jobs in %



The above mention risk factors bring various MPD issues that can be seen through the following graphical representation.

Figure 4

Major musculoskeletal issues were identified among employees in literature



Critical Analysis of Literature Review

The literature is full of various ergonomic risk factors related to jobs, and brings various MPD issues. Employees who are facing this type of risk need proper training and guidelines to overcome the risk associated with their jobs, as if the task is hard there must be a job performing tricks to avoid the physical job risk factors. If employees have to work continuously, there must be 3 to 5 minutes of exercise to relax their joints and to prevent them from locking at the same positions. Studies in literature showed that employees who were guided and trained to perform such hectic jobs showed carelessness, they don't bother the training and it causes different MPD issues. As literature showed, several risk factors are associated with jobs. A few suggestions are considerable to avoid the discussed issues. Strong and effective communication between the workforce and upper management is considerable as suggested to improve ergonomic situations at jobs (Enez and Nalbantoglu, 2019). Some warm up exercises can minimize the musculoskeletal problems as well as workers friendly hand tools should be arranged for employees to prevent the issues (Ishwarya and rajkumar, 2020). The intervention programs suggested to manage the risk factors (Shuval and Donchin, 2005), (Bhawana Rathore et al, 2020), (Foglemen and lewis, 2002), (Alireza choobineh, 2011). It was suggested to train employees to prevent body injuries and disorders (Hsin-yi kathy cheng et al, 2012), (Supaporn Meksawi et al, 2011). Study suggested that researchers should suggest better working postures to manage the organizational risk factors (T. Sakthi Nagaraj et al, 2019). This burden and risk can be reduced through job rotation (G. Mossa, 2015), (Alena and olga, 2017). (Jeenifer A hess et al, 2004) started a project on the laborers of construction sites, because they had high risk of musculoskeletal injuries. The Basic purpose of this project was to introduce some innovative way to minimize the risk of lower back pain. Employees' motion and movements were recorded while wearing a lumbar motion monitor, during initial use the movement was slightly significant and low back pain was slightly reduced. Engineers should design better production conditions to intervene

the ergonomics risk factors (Sourabh Kulkarni, 2019).

Conclusion

The aim of this paper is to review the literature to identify the ergonomics risk factors associated with a job and also to know the association between risk factors (organizational, psychosocial, physical and biomechanical risk factors) and work related musculoskeletal problems. The systematic literature review indicates that there are 4 risk factors associated to various jobs, out of 103 studies, 30% studies in systematic literature indicated biomechanical risk factors associates with MPD. 30% of studies indicate psychosocial risk factors are causes of MPD issues, 14% of studies showed MPD issue is caused by hard job related risk factors and 26% out of 103 studies directs that MPD issues are due to organizational risk factors. Major Musculoskeletal issues including, neck pain, shoulder's pain, back bent, back pain, CTD, palm pain, wrist pain, arms pain, knee pain and foot pain. These issues were arises as a result of job associated risk factors. Researchers suggest there must be ergonomic interventions to prevent employees from MPD issues. There must be provision of proper training and guidelines to employees, to overcome from job associated risk factors.

References

Abichandani, S., Shaikh, S., & Nadiger, R. (2013). Carpal tunnel syndrome–an occupational hazard facing dentistry. *International Dental Journal, 63*(5), 230-236.

Akalp, G., Aytac, S., Yamankaradeniz, N., Cankaya, O., Gokce, A., & Tufekci, U. (2015). Perceived safety culture and occupational risk factors among women in metal industries: A study in Turkey. *Procedia Manufacturing, 3*, 4956-4963.

Alexopoulos, E. C., Burdorf, A., & Kalokerinou, A. (2003). Risk factors for musculoskeletal disorders among nursing personnel in Greek hospitals. *International archives of occupational and environmental health, 76*(4), 289-294.

Asadi, H., Yu, D., & Mott, J. H. (2019). Risk factors for musculoskeletal injuries in airline maintenance, repair & overhaul. *International Journal of Industrial Ergonomics, 70*, 107-115.

Attar, S. M. (2014). Frequency and risk factors of musculoskeletal pain in nurses at a tertiary centre in Jeddah, Saudi Arabia: a cross sectional study. *BMC research notes, 7*(1), 1-6.

Babski-Reeves, K., Stanfield, J., & Hughes, L. (2005). Assessment of video display workstation set up on risk factors associated with the development of low back and neck discomfort. *International Journal of Industrial Ergonomics, 35*(7), 593-604.

Baek, K., Yang, S., Lee, M., & Chung, I. (2018). The association of workplace psychosocial factors and musculoskeletal pain among Korean emotional laborers. *Safety and health at work, 9*(2), 216-223.

Bentley, T. A., & Haslam, R. A. (2001). Identification of risk factors and countermeasures for slip, trip and fall accidents during the delivery of mail. *Applied ergonomics, 32*(2), 127-134.

Blatter, B. M., & Bongers, P. M. (2002). Duration of computer use and mouse use in relation to musculoskeletal disorders of neck or upper limb. *International Journal of Industrial Ergonomics, 30*(4-5), 295-306.

Bonfiglioli, R., Mattioli, S., Fiorentini, C., Graziosi, F., Curti, S., & Violante, F. S. (2007). Relationship between repetitive work and the prevalence of carpal tunnel syndrome in part-time and full-time female supermarket cashiers: a quasi-experimental study. *International archives of occupational and environmental health, 80*(3), 248-253.

Bongers, P. M., Ijmker, S., Van den Heuvel, S., & Blatter, B. M. (2006). Epidemiology of work related neck and upper limb problems: psychosocial and personal risk factors (part I) and effective interventions from a bio behavioural perspective (part II). *Journal of occupational rehabilitation, 16*(3), 272-295.

Borres, R. D., Lim, J. U., Robielos, R. A., & Pacaña, M. J. (2018, August). *Musculoskeletal disorders among orthodontists: risk factors and ergonomic intervention. In Congress of the International Ergonomics Association* (pp. 709-733). Springer, Cham.

Bos, E., Krol, B., van der Star, L., & Groothoff, J. (2007). Risk factors and musculoskeletal complaints in non-specialized nurses, IC nurses, operation room nurses, and X-ray technologists. *International archives of occupational and environmental health, 80*(3), 198-206.

Bot, S. D., Terwee, C. B., van der Windt, D. A., van der Beek, A. J., Bouter, L. M., & Dekker, J. (2007). Work-related physical and psychosocial risk factors for sick leave in patients with neck or upper extremity complaints. *International archives of occupational and environmental health, 80*(8), 733-741.

Botti, L., Battini, D., Sgarbossa, F., & Mora, C. (2020). Door-to-door waste collection: analysis and recommendations for improving ergonomics in an Italian case study. *Waste Management, 109*, 149-160.

Bovenzi, M., Della Vedova, A., Nataletti, P., Alessandrini, B., & Poian, T. (2005). Work-related disorders of the upper limb in female workers using orbital sanders. *International archives of occupational and environmental health, 78*(4), 303-310.

Brandt, M., Madeleine, P., Ajslev, J. Z. N., Jakobsen, M. D., Samani, A., Sundstrup, E., ... & Andersen, L. L. (2015). Participatory intervention with objectively measured physical risk factors for musculoskeletal disorders in the construction industry: study protocol for a cluster randomized controlled trial. *BMC musculoskeletal disorders, 16*(1), 1-9.

Burnett, D. R., & Campbell-Kyureghyan, N. H. (2010). Quantification of scan-specific ergonomic risk-factors in medical sonography. *International Journal of Industrial Ergonomics, 40*(3), 306-314.

Cagnie, B., Danneels, L., Van Tiggelen, D., De Loose, V., & Cambier, D. (2007). Individual and work related risk factors for neck pain among office workers: a cross sectional study. Burnett, D. R., & Campbell-Kyureghyan, N. H. (2010). Quantification of scan-specific ergonomic risk-factors in medical sonography. International Journal of Industrial Ergonomics, 40(3), 306-314.

Chaiklieng, S., & Suggaravetsiri, P. (2015). Ergonomics risk and neck shoulder back pain among dental professionals. *Procedia Manufacturing, 3*, 4900-4905.

Chen, X., O'Leary, S., & Johnston, V. (2018). Modifiable individual and work-related factors associated with neck pain in 740 office workers: a cross-sectional study. *Brazilian journal of physical therapy, 22*(4), 318-327.

Cheng, H. Y. K., Cheng, C. Y., & Ju, Y. Y. (2013). Work-related musculoskeletal disorders and ergonomic risk factors in early intervention educators. *Applied ergonomics, 44*(1), 134-141.

Chiasson, M. E., Imbeau, D., Major, J., Aubry, K., & Delisle, A. (2015). Influence of musculoskeletal pain on workers' ergonomic risk-factor assessments. *Applied ergonomics, 49*, 1-7.

Chiu, T. T. W., Ku, W. Y., Lee, M. H., Sum, W. K., Wan, M. P., Wong, C. Y., & Yuen, C. K. (2002). A study on the prevalence of and risk factors for neck pain among university academic staff in Hong Kong. *Journal of occupational rehabilitation, 12*(2), 77-91.

Choobineh, A., Motamedzade, M., Kazemi, M., Moghimbeigi, A., & Pahlavian, A. H. (2011). The impact of ergonomics intervention on psychosocial factors and musculoskeletal symptoms among office workers. *International Journal of Industrial Ergonomics, 41*(6), 671-676.

Coenen, P., Kingma, I., Boot, C. R., Twisk, J. W., Bongers, P. M., & van Dieën, J. H. (2013). Cumulative low back load at work as a risk factor of low back pain: a prospective cohort study. *Journal of occupational rehabilitation, 23*(1), 11-18.

Côté, P., van der Velde, G., Cassidy, J. D., Carroll, L. J., Hogg-Johnson, S., Holm, L. W., ... & Peloso, P. M. (2009). The burden and determinants of neck pain in workers: results of the Bone and Joint Decade 2000–2010 Task Force on Neck Pain and Its Associated Disorders. *Journal of manipulative and physiological therapeutics, 32*(2), S70-S86.

Dable, R. A., Wasnik, P. B., Yeshwante, B. J., Musani, S. I., Patil, A. K., & Nagmode, S. N. (2014). Postural assessment of students evaluating the need of ergonomic seat and magnification in dentistry. *The Journal of Indian Prosthodontic Society, 14*(1), 51-58.

Dellve, L., Lagerström, M., & Hagberg, M. (2003). Work-system risk factors for permanent work disability among home-care workers: a case-control study. *International archives of occupational and environmental health, 76*(3), 216-224.

Dhimitri, K. C., McGwin Jr, G., McNeal, S. F., Lee, P., Morse, P. A., Patterson, M., ... & Marx, J. L. (2005). Symptoms of musculoskeletal disorders in ophthalmologists. *American journal of ophthalmology, 139*(1), 179-181.

Dianat, I., Bazazan, A., Azad, M. A. S., & Salimi, S. S. (2018). Work-related physical, psychosocial and individual factors associated with musculoskeletal symptoms among surgeons: Implications for ergonomic interventions. *Applied ergonomics, 67*, 115-124.

Dianat, I., Kord, M., Yahyazade, P., Karimi, M. A., & Stedmon, A. W. (2015). Association of individual and work-related risk factors with musculoskeletal symptoms among Iranian sewing machine operators. *Applied ergonomics, 51*, 180-188.

Diyana, M. A., Karmegam, K., Shamsul, B. M. T., Irniza, R., Vivien, H., Sivasankar, S., ... & Kulanthayan, K. C. M. (2019). Risk factors analysis: Work-related musculoskeletal disorders among male traffic policemen using high-powered motorcycles. *International Journal of Industrial Ergonomics, 74*, 102863.

Driessen, M. T., Proper, K. I., Anema, J. R., Bongers, P. M., & van der Beek, A. J. (2010). Process evaluation of a participatory ergonomics programme to prevent low back pain and neck pain among workers. *Implementation Science, 5*(1), 1-11.

Feng, C. K., Chen, M. L., & Mao, I. (2007). Prevalence of and risk factors for different measures of low back pain among female nursing aides in Taiwanese nursing homes. *BMC musculoskeletal disorders, 8*(1), 1-9.

Fogleman, M., & Lewis, R. J. (2002). Factors associated with self-reported musculoskeletal discomfort in video display terminal (VDT) users. *International Journal of Industrial Ergonomics, 29*(6), 311-318.

Griffiths, K. L., Mackey, M. G., & Adamson, B. J. (2007). The impact of a computerized work environment on professional occupational groups and behavioural and physiological risk factors for musculoskeletal symptoms: a literature review. *Journal of occupational rehabilitation, 17*(4), 743-765.

Hess, J. A., Hecker, S., Weinstein, M., & Lunger, M. (2004). A participatory ergonomics intervention to reduce risk factors for low-back disorders in concrete laborers. *Applied Ergonomics, 35*(5), 427-441.

Holcroft, C. A., & Punnett, L. (2009). Work environment risk factors for injuries in wood processing. *Journal of Safety Research, 40*(4), 247-255.

Huysmans, M. A., IJmker, S., Blatter, B. M., Knol, D. L., van Mechelen, W., Bongers, P. M., & van der Beek, A. J. (2012). The relative contribution of work exposure, leisure time exposure, and individual characteristics in the onset of arm–wrist–hand and neck–shoulder symptoms among office workers. *International archives of occupational and environmental health, 85*(6), 651-666.

Jun, D., Zoe, M., Johnston, V., & O'Leary, S. (2017). Physical risk factors for developing non-specific neck pain in office workers: a systematic review and meta-analysis. *International archives of occupational and environmental health, 90*(5), 373-410.

Juul-Kristensen, B., Fallentin, N., Hansson, G. Å., Madeleine, P., Andersen, J. H., & Ekdahl, C. (2002). Physical workload during manual and mechanical deboning of poultry. *International Journal of Industrial Ergonomics, 29*(2), 107-115.

Kaliniene, G., Ustinaviciene, R., Skemiene, L., & Januskevicius, V. (2013). Associations between neck musculoskeletal complaints and work related factors among public service computer workers in Kaunas. *International journal of occupational medicine and environmental health, 26*(5), 670-681.

Kaliniene, G., Ustinaviciene, R., Skemiene, L., Vaiciulis, V., & Vasilavicius, P. (2016). Associations between musculoskeletal pain and work-related factors among public service sector computer workers in Kaunas County, Lithuania. *BMC musculoskeletal disorders, 17*(1), 1-12.

Kee, D., & Seo, S. R. (2007). Musculoskeletal disorders among nursing personnel in Korea. International *Journal of Industrial Ergonomics, 37*(3), 207-212.

Khan, S. A., & Yee Chew, K. (2013). Effect of working characteristics and taught ergonomics on the prevalence of musculoskeletal disorders amongst dental students. *BMC musculoskeletal disorders, 14*(1), 1-8.

Kitis, A., Celik, E., Aslan, U. B., & Zencir, M. (2009). DASH questionnaire for the analysis of musculoskeletal symptoms in industry workers: a validity and reliability study. *Applied ergonomics, 40*(2), 251-255.

Kostova, V., & Koleva, M. (2001). Back disorders (low back pain, cervicobrachial and lumbosacral radicular syndromes) and some related risk factors. *Journal of the neurological sciences, 192*(1-2), 17-25.

Kumar, P., Chakrabarti, D., Patel, T., & Chowdhuri, A. (2016). Work-related pains among the workers associated with pineapple peeling in small fruit processing units of North East India. International *Journal of Industrial Ergonomics, 53*, 124-129.

Lahelma, E., Laaksonen, M., Lallukka, T., Martikainen, P., Pietiläinen, O., Saastamoinen, P., ... & Rahkonen, O. (2012). Working conditions as risk factors for disability retirement: a longitudinal register linkage study. *BMC public health, 12*(1), 1-10.

Linton, S. J. (2005). Do psychological factors increase the risk for back pain in the general population in both a cross-sectional and prospective analysis?. *European Journal of Pain, 9*(4), 355-361.

Lis, A. M., Black, K. M., Korn, H., & Nordin, M. (2007). Association between sitting and occupational LBP. *European spine journal, 16*(2), 283-298.

Massaccesi, M., Pagnotta, A., Soccetti, A., Masali, M., Masiero, C., & Greco, F. (2003). Investigation of work-related disorders in truck drivers using RULA method. *Applied ergonomics, 34*(4), 303-307.

Mattioli, S., Baldasseroni, A., Bovenzi, M., Curti, S., Cooke, R. M., Campo, G., ... & Violante, F. S. (2009). Risk factors for operated carpal tunnel syndrome: a multicenter population-based case-control study. *BMC Public Health, 9*(1), 1-15.

Meksawi, S., Tangtrakulwanich, B., & Chongsuvivatwong, V. (2012). Musculoskeletal problems and ergonomic risk assessment in rubber tappers: A community-based study in southern Thailand. *International Journal of Industrial Ergonomics, 42*(1), 129-135.

Mirmohammadi, S., Yazdani, J., Etemadinejad, S., & Asgarinejad, H. (2015). A cross-sectional study on work-related musculoskeletal disorders and associated risk factors among hospital health cares. *Procedia Manufacturing, 3*, 4528-4534.

Moon, J. H., Kim, K. W., & Moon, N. J. (2016). Smartphone use is a risk factor for pediatric dry eye disease according to region and age: a case control study. *BMC ophthalmology, 16*(1), 1-7.

Mossa, G., Boenzi, F., Digiesi, S., Mummolo, G., & Romano, V. A. (2016). Productivity and

ergonomic risk in human based production systems: A job-rotation scheduling model. *International Journal of Production Economics, 171*, 471-477.

Murphy, S., Buckle, P., & Stubbs, D. (2004). Classroom posture and self-reported back and neck pain in schoolchildren. *Applied ergonomics, 35*(2), 113-120.

Nagaraj, T. S., Jeyapaul, R., & Mathiyazhagan, K. (2019). Evaluation of ergonomic working conditions among standing sewing machine operators in Sri Lanka. *International Journal of Industrial Ergonomics, 70*, 70-83.

Nath, N. D., Akhavian, R., & Behzadan, A. H. (2017). Ergonomic analysis of construction worker's body postures using wearable mobile sensors. *Applied ergonomics, 62*, 107-117.

Neal, B. S., Griffiths, I. B., Dowling, G. J., Murley, G. S., Munteanu, S. E., Franettovich Smith, M. M., ... & Barton, C. J. (2014). Foot posture as a risk factor for lower limb overuse injury: a systematic review and meta-analysis. *Journal of foot and ankle research, 7*(1), 1-13.

Neumann, W. P., Wells, R. P., Norman, R. W., Frank, J., Shannon, H., Kerr, M. S., & OUBPS Working Group. (2001). A posture and load sampling approach to determining low-back pain risk in occupational settings. *International Journal of Industrial Ergonomics, 27*(2), 65-77.

Nordander, C., Ohlsson, K., Balogh, I., Hansson, G. Å., Axmon, A., Persson, R., & Skerfving, S. (2008). Gender differences in workers with identical repetitive industrial tasks: exposure and musculoskeletal disorders. *International archives of occupational and environmental health, 81*(8), 939-947.

Oha, K., Animägi, L., Pääsuke, M., Coggon, D., & Merisalu, E. (2014). Individual and work-related risk factors for musculoskeletal pain: a cross-sectional study among Estonian computer users. *BMC musculoskeletal disorders, 15*(1), 1-5.

Ortiz-Hernández, L., Tamez-González, S., Martínez-Alcántara, S., & Méndez-Ramírez, I. (2003). Computer use increases the risk of musculoskeletal disorders among newspaper office workers. *Archives of medical research, 34*(4), 331-342.

Otto, A., & Scholl, A. (2011). Incorporating ergonomic risks into assembly line balancing. *European journal of operational research, 212*(2), 277-286.

Öztürk, N., & Esin, M. N. (2011). Investigation of musculoskeletal symptoms and ergonomic risk factors among female sewing machine operators in Turkey. *International Journal of Industrial Ergonomics, 41*(6), 585-591.

Pavlovic-Veselinovic, S., Hedge, A., & Veselinovic, M. (2016). An ergonomic expert system for risk assessment of work-related musculo-skeletal disorders. *International Journal of Industrial Ergonomics, 53*, 130-139.

Rathore, B., Pundir, A. K., & Iqbal, R. (2020). Ergonomic risk factors in glass artware industries and prevalence of musculoskeletal disorder. *International Journal of Industrial Ergonomics, 80*, 103043.

Salik, Y., & Özcan, A. (2004). Work-related musculoskeletal disorders: a survey of physical therapists in Izmir-Turkey. *BMC musculoskeletal disorders, 5*(1), 1-7.

Scuffham, A. M., Legg, S. J., Firth, E. C., & Stevenson, M. A. (2010). Prevalence and risk factors associated with musculoskeletal discomfort in New Zealand veterinarians. *Applied ergonomics, 41*(3), 444-453.

Sharan, D., Parijat, P., Sasidharan, A. P., Ranganathan, R., Mohandoss, M., & Jose, J. (2011). Workstyle risk factors for work related musculoskeletal symptoms among computer professionals in India. *Journal of occupational rehabilitation, 21*(4), 520-525.

Sonne, M., Villalta, D. L., & Andrews, D. M. (2012). Development and evaluation of an office ergonomic risk checklist: ROSA–Rapid office strain assessment. *Applied ergonomics, 43*(1), 98-108.

Szeto, G. P., Ho, P., Ting, A. C., Poon, J. T., Cheng, S. W., & Tsang, R. C. (2009). Work-related

musculoskeletal symptoms in surgeons. *Journal of occupational rehabilitation, 19*(2), 175-184.

Thornton, L. J., Stuart-Buttle, C., Wyszynski, T. C., & Wilson, E. R. (2004). Physical and psychosocial stress exposures in US dental schools: the need for expanded ergonomics training. *Applied ergonomics, 35*(2), 153-157.

Tsauo, J. Y., Jang, Y., Du, C. L., & Liang, H. W. (2007). Incidence and risk factors of neck discomfort: a 6-month sedentary-worker cohort study. *Journal of occupational rehabilitation, 17*(2), 171-179.

Vieira, E. R., & Kumar, S. (2007). Occupational risks factors identified and interventions suggested by welders and computer numeric control workers to control low back disorders in two steel companies. *International journal of industrial ergonomics, 37*(6), 553-561.

Vindigni, D., Walker, B. F., Jamison, J. R., Da Costa, C., Parkinson, L., & Blunden, S. (2005). Low back pain risk factors in a large rural Australian Aboriginal community. An opportunity for managing co-morbidities?. *Chiropractic & osteopathy, 13*(1), 1-12.

Werner, R. A. (2006). Evaluation of work-related carpal tunnel syndrome. *Journal of occupational rehabilitation, 16*(2), 201-216.

Werner, R. A., Franzblau, A., Gell, N., Ulin, S. S., & Armstrong, T. J. (2005). A longitudinal study of industrial and clerical workers: predictors of upper extremity tendonitis. *Journal of occupational rehabilitation, 15*(1), 37-46.

Widanarko, B., Legg, S., Devereux, J., & Stevenson, M. (2014). The combined effect of physical, psychosocial/organisational and/or environmental risk factors on the presence of work-related musculoskeletal symptoms and its consequences. *Applied ergonomics, 45*(6), 1610-1621.

Widanarko, B., Legg, S., Devereux, J., & Stevenson, M. (2015). Interaction between physical and psychosocial work risk factors for low back symptoms and its consequences amongst Indonesian coal mining workers. *Applied ergonomics, 46*, 158-167.

Widanarko, B., Legg, S., Stevenson, M., Devereux, J., Eng, A., Cheng, S., & Pearce, N. (2012). Prevalence and work-related risk factors for reduced activities and absenteeism due to low back symptoms. *Applied ergonomics, 43*(4), 727-737.

Woods, V., & Buckle, P. (2006). Musculoskeletal ill health amongst cleaners and recommendations for work organisational change. *International Journal of Industrial Ergonomics, 36*(1), 61-72.

Yang, L., Money, S. R., Morrow, M. M., Lowndes, B. R., Weidner, T. K., Fortune, E., ... & Hallbeck, M. S. (2020). Impact of procedure type, case duration, and adjunctive equipment on surgeon intraoperative musculoskeletal discomfort. *Journal of the American College of Surgeons, 230*(4), 554-560.

Zare, M., Bodin, J., Cercier, E., Brunet, R., & Roquelaure, Y. (2015). Evaluation of ergonomic approach and musculoskeletal disorders in two different organizations in a truck assembly plant. *International Journal of Industrial Ergonomics, 50*, 34-42.