

REVIEW ARTICLE

Does Prolonged Standing at Work Among Teachers Associated With Musculoskeletal Disorders (MSDs)?

Ayuni Nabilah Alias¹, Karmegam Karuppiah¹, Vivien How¹, Velu Perumal²

¹ Department of Environmental & Occupational Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

² Industrial Design Department, Faculty of Design & Architecture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

ABSTRACT

In order to accomplish a wide range of duties and responsibilities that may be done under unpleasant working conditions, prolonged standing posture is common with school teachers. Nevertheless, standing upright for a long time or otherwise regarded as prolonged standing frequently contributes to body pain and discomfort, muscle fatigue and even health problems such as musculoskeletal disorders (MSDs). The aim of this paper is to review MSDs arising from prolonged standing and spread information on existing ergonomic and non-ergonomic interventions to alleviate prolonged standing discomfort. Systematic review on prolonged standing school teachers with specific keywords were recognized to discover the appropriate studies and information in a systematic search. The informations in this review may be helpful to guide teacher, school management and researchers to implement the suitable interventions in order to minimise the health issue due to MSDs among school teachers.

Keywords: School teacher, Musculoskeletal Disorders, Prolonged Standing, Work-related Musculoskeletal Disorders, Ergonomic Interventions

Corresponding Author:

Karmegam Karuppiah, PhD
Email: megam@upm.edu.my
Tel: +603-9769 2513

INTRODUCTION

Employment is an important component of earning in every human being's life but if it is not performed inappropriately, it can become health risk to every worker. Most of the occupational groups are vulnerable to work-related musculoskeletal discomfort or pain due to job characteristics. Among of these groups, school teachers are the group that stand out (1). In Malaysia, teachers are one of the largest professional occupations and can be considered as a mass profession. There are 423,566 school teachers in Malaysia who make the education sector the highest in terms of total public service staff. Teaching profession was aimed by government at raising the quality and standard of education which is represented by policy production and enactment based on the Education Development Master Plan (2006-2010) and the Malaysian Education Blueprint 2013-2025. Both policies focus specifically on the teaching profession and seriously concerned about teachers' important roles in developing good human capital for Malaysian economic development (2).

Quite often, teaching is conducted under undesirable circumstances, in which school teachers utilize their

physical, mental, and psychological ability to reach the successful aims of teaching, over-demanding and stimulating their psychophysiological roles through the teaching process. When teachers do not have enough time to recover from pain or injury, the effects of the pain caused by a significant health problems absenteeism will be exacerbated and worsened (1). Teachers are the occupation that require standing for longer duration and often associated with increased risk of body's pain and discomfort throughout school hours. The Oxford Dictionary (3) described 'standing' as being upright, hold up by one's feet, while 'prolonged' is sustaining same posture for a lengthy time than normal. 'Prolonged standing' has been defined with worker needs to sustain standing position and spending more than 50% of total working hours during a full work shift in the standing position (4). Working in a standing position can be viewed as the most suitable and desirable position due to the flexibility of limbs with a large degree of freedom. Nevertheless, if workers spend prolonged time in a standing position during their working hours (more than 50% of total working hours) they may feel pain and muscle exhaustion at the end of the working day. Thus it will make a crucial contribution to decreasing workers' productivity in during working. Prolonged standing posture may cause sore feet, swelling of the legs, varicose veins, muscle and body fatigue, low back pain, stiffness of the neck and shoulders, and other health issues. Prolonged standing also effectively reduces blood supply to the muscles resulting in accelerated

fatigue onset and causes pain in the muscles of the arms, back and neck, as well as blood pooling in the legs and feet contributing to varicose veins (5).

The most familiar health issues due to prolonged standing among teachers are musculoskeletal disorders (MSDs). “MSDs are defined as musculoskeletal system disabilities or conditions where vulnerability to multiple risk factors present in the work environment may either have contributed to the development of the disorders or worsened a pre-existing condition” (6). MSDs are amongst the most critical and widespread working health condition in the occupational group with a major influence on standard of living and a significant financial influence on insurance rates and loss of wages (7) Depending on the location of suffering, MSDs are classified in different categories. One of MSDs classification is upper limb conditions that include some disability or condition from fingers to shoulder or neck. A lower limb is another classification of MSDs which involves pain or hip-to-toe conditions. Body tissues, bones, tendons, ligaments and nerves may be impaired by MSDs. The bulk of associated MSDs evolve over the years and are triggered either by the work of teachers themselves or by the workplace environment (8).

Prolonged standing or standing over long periods of time can contribute to a slow deterioration of posture. During giving a lesson in a classroom with standing position, teachers usually tend to slouch and move their weight from one foot to another in order to relieve pressure. Slouching encourages a stationary stance that allows the employee less aware and more passive. It can contribute to circulation problems such as swollen feet and legs if this painful posture is held for teachers with prolonged standing. Prolonged standing also causes the joints to be partly immobilized or lodged in the legs, knees and feet. Subsequently, this immobility may lead to rheumatic diseases related to tendons and ligaments being degenerated. Without some relief by walking, prolonged and frequent standing while teaching may causes blood to pool in the legs and feet. When prolonged standing without any rest within teaching period, this may lead to inflammation of the veins. The inflammation can lead to varicose vein that are persistent and painful for a long period of time (9).

Nevertheless, there is no sufficient worldwide recognition among researchers either in studies or publications for prolonged standing teachers and the aftereffect of work-related musculoskeletal disorders (WMSDs). Although there has been a big amount of research on other occupational groups for WMSDs information on these ergonomic health problems, there are still minimal literature exposure of WMSDs among school teachers. Consequently, this review’s goal will likely fundamentally investigate the literature and report on the prolonged standing school teachers contributed to work-related musculoskeletal disorders (WMSDs),

related risk factors and interventions.

METHODOLOGY

Specific keywords were recognized to discover the appropriate studies and information in a systematic search. Electronic database including ELCOSH, PubMed, Science Direct, Google Scholar, SAGE Publications and Springer has been used has been used to focus the search on the years of 1990 until 2019 in order to encompass the studies on school teachers. A larger year would maximize the articles and studies related to this review especially related to the teaching profession. Following keywords and combination of these words were searched: school teachers, prolonged standing, musculoskeletal disorders, work-related musculoskeletal disorders, prevalence, risk factors of MSDs, upper extremity musculoskeletal disorders, lower extremity musculoskeletal disorders.

Intending to obtain an overview of previous research published in worldwide studies relating to “musculoskeletal disorder among school teachers”, this review obtain 230 hits for all the search strings. Inclusion criteria included articles and studies that have 1) fulltime teachers, 2) have more than 1 year school teaching experience, 3) have standing/prolonged standing posture during teaching, 4) have related risk factors to MSDs/WMSDs, 5) have upper limbs and lower limbs prevalence related to MSDs/WMSDs (Figure 1). Due to selection criteria, only 8 studies that fully fulfilled the requirement for this review paper. The chance-adjusted between-reviewer agreement on the included studies was good ($\kappa=0.83$).

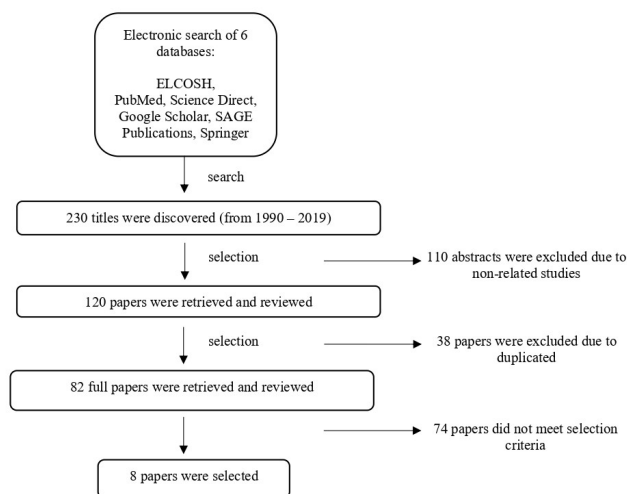


Figure 1: Overview of literature search and review

RESULTS

A total of 8 articles have been identified and reviewed according to specific keywords (Table I). Table I showed the summary of 8 studies that related to studies of prolonged standing at work among school teachers associated with musculoskeletal disorders (MSDs).

TABLE 1: Studies Of Prolonged Standing at Work among School Teachers associated with Musculoskeletal Disorders (MSDs)

Reference	Location	Title	Sample	Prevalence and Risk Factors
Ndawa, Nyamari & Ileri (2019)	Kenya	Predictors of Work-Related Musculoskeletal Disorders among Primary School Teachers in Machakos County, Kenya	302 primary school teachers comprised of 116 (38.41%) male and 186 (61.59%) female	Prevalence at any site of body (85.1%) with lower back (58.6%), knees (57.6%), neck (53.3%) and ankles (53%). The positive associate risk factors were age, teaching for over 4 hours while standing, teaching for over 4 hours while sitting, working on head-down posture and lack of back support on chairs.
Eggers, Pillay & Govender (2018)	South Africa	Musculoskeletal Pain among School Teachers are we underestimating its impact?	177 primary school teachers comprised of 63 (64.9%) females and 9 (9.3%) males	The prevalence of neck-shoulder pain (NSP) and low back pain (LBP) was 80.4% and 68.0%. Risk factors associated with NSP were marking of assessments (56.7%) and writing on a blackboard (39.2%). LBP was associated with prolonged standing (83.5%).
Gendy & Korish (2017)	Cairo, Egypt	Work Related Musculoskeletal Disorders among Preparatory School Teachers in Egypt	200 preparatory school teachers comprised of 83 (41.5%) males and 117 (58.5%) females	The neck and back (83.5%) were the most commonly affected parts followed by upper limb. Prolonged standing and high workload were significantly related to upper limb, lower limb, neck and back injuries.
Vaghela & Parekh (2017)	Gujarat, India	Prevalence of Musculoskeletal Disorder among School Teachers	314 secondary and primary school teachers comprised of 72.21% (female)s and 27.79% (males)	Total prevalence of MSD 71.95% Females were more affected with 72% than the males with 28%. Knee (33.73%) and thigh pain (7.01%) occurs in teacher due to prolonged standing for several hours and repetitive stair climbing in school.
Balakrishnan, Chellappan & Thenmozhi (2016)	Pahang, Malaysia	Prevalence of Low Back Pain and Its Risk Factors among Secondary School Teachers at Bentong, Pahang	253 secondary school teachers comprised of 108 (42.6%) males and 145 (57.4%) females from 5 schools.	Prevalence of low back pain (LBP) is high among secondary school teachers (62.5%) with female having higher complaint compare to male (78.8% vs. 40.7%). The highest risk factor for LBP is prolong standing 23.4%), followed by prolong sitting (19.0%) and working with computer (16.5%).
Mohseni Bandpei, Ehsani, Behtash & Ghanipour (2014)	Iran	Occupational Low Back Pain in Primary and High School Teachers: Prevalence and Associated Factors	586 school teachers comprised 387 (66.4%) female and 197 (33.6%) males	The prevalence for low back pain (LBP) for last month, last 6 months, annual, and lifetime were 21.8%, 26.3%, 29.6%, 31.1% and 36.5%. Female teachers seemed to be more affected than male, although this difference was not statistically significant (P=0.26). BMI, job satisfaction and who had experience of longer than 20 years were significantly associated with prevalence of LBP (P<0.05). Prolonged sitting, prolonged standing, working hours with computer, and correcting examination papers (27.4%, 25.2%, 24.3% and 15.5%).
Yue, Liu & Li (2012)	China	Neck/Shoulder Pain and Low Back Pain among School Teachers in China, Prevalence and Risk Factors.	893 teachers from primary, junior and secondary schools comprised of 598 (67.0%) females and 295 (33.0%) males	The prevalence of NSP and LBP was 48.7% and 45.6%. Females teachers had a significantly higher prevalence of NSP than male teachers (51.7% vs 42.7%, P=0.01). There was significant difference among age groups in the prevalence of LBP (P=0.03). NSP was positively associated with physical exercise, prolonged standing, sitting and static posture. For LBP was more associated with twisting posture, uncomfortable back support, prolonged sitting and static posture.
Samad, Abdullah, Moin, Mohd Tamrin & Hashim (2010)	Klang Valley, Malaysia	Prevalence of Low Back Pain and Its Risk Factors among School Teachers	272 primary school teachers comprised of 191 (66.5%) females and 81 (33.5%) males from 9 schools.	The prevalence of low back pain (LBP) among primary school teachers was 40.4% with higher among female teachers (48.1%) compare to male teachers (39.6%). Prevalence of LBP was higher in the rural area (47.8%) compare to urban area (46.3%) and industrial area (40.2%). Risk factors contributed to LBP were highest from lifting loads (28.0%), followed by prolong sitting (25.2%), prolonged standing (23.4%), activities during physical education session and walking up and down stairs (13.5%) and lastly, working with computer (6.3%). Poor mental health also contributes to LBP.

DISCUSSION

Work-Related Musculoskeletal Disorders (WMSDs)

Work-related musculoskeletal disorders (WMSDs) refer to circumstances in which the individual has encountered pain or discomfort in these particular areas of the body (neck, shoulder, lower or upper back, elbow, arm, hand, hip and feet), joint torment, swelling and tingling (10). WMSDs is the disorders of the musculoskeletal system's nerves, tendons, muscles and support structures that can contribute to discomfort, weakness, stiffness, pain, regional swelling, numbness, tingling, and joint pressure. WMSDs usually develops from accumulative dysfunction due to prolonged exposure to unsafe levels of both physiological and psychosocial pressure at the workplace. The major risk factors in the workplace for WMSDs include, but no limited to heavy manual handling, repetitive action, vibration, awkward and static postures resulting from badly designed workstations, tools, equipments, working methods and poor organization of work (5). Prolonged standing has been recognized as an important contributor to WMSDs. When person conduct work tasks in a standing place for over 4 hours every day, they may have subjected to WMSDs (11).

Teachers' work task involve a wide range of tasks and responsibilities that may be handled under unfavourable working conditions, particularly in developing countries. These may include or lead to prolonged standing and awkward posture while writing on the table, helping students with their research or helping students during extracurricular activities, especially during physical education period. Therefore, these factors have been strongly associated with the teaching profession's development of WMSDs (12,13). Based on systematically reviewed studies by researchers, the self-reported prevalence among school teachers related to WMSDs varies from 39% to 95%, with upper limbs and lower limbs being the affected symptom areas. The role of school teachers involves teaching students, planning classes, marking homework, and administrative school work that may trigger discomfort on upper limb and lower limb body parts (13,14).

Upper Extremity Musculoskeletal Disorders and Prolonged Standing

Upper Extremity Musculoskeletal Disorders (UEMSDs) are disorders that affect the neck, shoulder, arms and hands' soft tissue (15). Most UEMSDs are characterized by repeated episodes of pain with disability, which vary in severity and impact. Most of the occurrences become self-limiting and wind up with long-term chronic problems within days or weeks (16). Work activities involving prolonged standing, heavy lifting, uncomfortable postures and repetitive among school teachers movements may lead to the development of WMSDs. For example, standing up during classroom teaching and repeated overhead writing on board are

also unsafe acts and contributed to the development of neck and shoulder pain (NSP) and upper limbs pain found in teachers (17,18,19). For more than 4 hours when standing, MSDs of the neck, shoulder and wrists were significantly correlated with teaching. This observation is compatible with Yue et al.'s (14) finding that prolonged standing was a risk factor to shoulder and neck pain (OR:2.23, 95% CI:1.48-3.78). Yue et al. (14) also reported that teaching lessons with static posture, prolonged standing and sitting, and holding of the neck in the forward bend posture were all related to LBP and NSP for more than 14 hours per week. Eggers, Pillay and Govender (20) also reported that increasing in prevalence of MSDs ($p < 0.01$) was correlated with prolonged standing among school teachers. The exertion of the body while standing may justify the importance of predictor. Following prolonged periods of standing one is likely to experience discomfort or pain on other parts of the body. This is because teachers likely to spend lot of their times standing during school hours when completing lessons in classroom in order to make sure lesson and principles are fully understood by students. According to Ndawa, Nyamari & Ileri's study (21), teaching the teaching session while standing was significant indicator of MSDs. In this regard, result showed that there was higher prevalence for MSDs affecting shoulders, wrists, and upper back among school teachers who taught while standing for between 1 and 2 hours ($p < 0.05$). Teachers in Egypt also reported that the most widely affected upper limb parts were the neck and back (83.5%). Standing for long periods of time and excessive workload was significantly associated with the injuries on upper limb, lower limb, neck and back. Approximately, 18.9% of teachers took sick leave up to 7 days owing to their condition (22). These results are consistent with previous studies in other countries: a chinese survey on school teachers recorded a high prevalence of pain in the neck (68.9%) and pain in the shoulder (73.4%) in the previous month. Another report found that 42.5% of Turkish school teachers are suffering from neck pain and 28.7% of them suffer from shoulder pain in previous month (23).

Lower Extremity Musculoskeletal Disorders and Prolonged Standing

Musculoskeletal disorders (MSDs) are a major cause of work-related injury and workers that absence from the workplace. Nonetheless, much less attention has been paid to the epidemiology of lower extremity musculoskeletal disorders (LEMSDs) in contrast to work-related MSDs of the upper limbs and lower back region (24). LEMSDs are distinct from MSDs impacting the back, neck and the upper limbs, as they can sometimes lead to higher rates of immobility and thus significantly worsen the quality of life (25, 26). In recent study showed that knee (33.73%), ankle/foot (25.41%) and hip/thigh (7.01%) discomfort develops due to prolonged standing at school for so many hours and frequent stairs climbing through school hours among school teachers in India

(1). The prevalence of MSDs affecting knees were higher among teachers in Kenya who taught between while standing for between 1 and 2 hours as stated in study by Ndawa, Nyamari and Ileri (21).

Due to long hours of standing during teaching, postural discomfort in the classroom, painful on lower back while seated, repeated bending, repetitive and awkward posture, MSDs in the lower extremities could be impaired among school teacher in China (14). However, teachers face social and psychological challenges every day within and outside the school and have recorded fewer time for rest after school hours because of extra work that needed standing at home, which could lead to chronic impaired musculoskeletal disorders (27,28). Findings from Mohseni Bandpei et al. (29) confirmed there was a higher risk lower back pain in school teachers who had prolonged sitting and standing, computer-related long hours of work and corrected paper examination.

Majority of secondary school teachers in Bentong, Pahang with "moderate" low back pain relative to "mild" and "severe" pain (50.6% vs. 40.5% and 8.9%) due to prolonged standing as the highest risk factors contributed to WMDs (30). In Brazil, through a cross-sectional analysis, Cardoso et al., (12) evaluated the incidence of MSDs and their correlations with socio-background and work-related factors. The prevalence of pain was 41.1%, 23.7% and 41.1% overall in the lower limb, upper limb and lower. There have been important correlations between race, gender, employment, marital status, amount of children, years of experience and the incidence of MSDs. Thus, various work situations and requirements of school teachers for educating, evaluating the homework done by students, correcting exam papers, and using computer that necessitate prolonged standing and sitting can be considered as a risk factors for MSDs.

Factors contributed to WMSDs from Prolonged Standing

Age

Nevertheless, ageing may not have been a likely justification because the average age of the participants with SD 9.94 was still 38.8 years. The growth of symptomatic degenerative WMSDs with a high prevalence would be too early. Therefore, a more plausible interpretation than ageing can be the cumulative effect of workloads. Several studies confirmed with their observation of the correlation of the length of work with WMSDs (1).

There was also a large difference in age of upper back pain ($p < 0.05$) on the musculoskeletal system. The middle age class (31-50 years old) had a higher prevalence of upper back discomfort and the older teachers (> 50) had a higher prevalence of lower limb varicose veins ($p < 0.05$) than the younger teachers (< 31 years old) (13). Besides that, Cardoso et al., (12) also stated that the incidence of

musculoskeletal symptoms increased with the duration of teachers' work experience, even although the mean teachers age (27.6 years, SD 4.9) was younger and the period of work experience (5.5 years, SD 3.2) was shorter than that the findings of Vaghela and Parekh's (1) According to Ndawa, Nyamari, Ileri (21), there was a positive relationship from 45 to 49 years and over 50 years of neck MSD with teachers. There was also positive association between rising age and shoulder pain. Risk factors for low back pain have been reported to include human variables such as body weight and age, biomechanical factors such as heavy physical load, prolonged static posture and lifting and psychosocial factors such as job satisfaction, time and demands as well as job stress (31,32,33). The school teachers' work natures included all the above-mentioned risk factors. Gendy and Korisha (22) also reported that upper limbs disorders were related to age and BMI but lower limb disorders were not.

Gender

According to survey in Bentong, Pahang Female teachers disclosed a higher prevalence of LBP than male teachers (74.5% VS 46.3%) (30). In Yue et al., (14) research, which is consistent with previous studies (34,35), NSP prevalence was significantly higher among female teachers (51.7%) than male teachers (42.7%). Female teachers seem to exhibit more symptoms of the neck, shoulder, and upper limb than men (13,17) consistently. Several reasons may explain the gender difference, one of which might be that women were more likely to suffer from emotional tiredness compared to men among teachers (36). This can also be clarified in part by women with a lower pain tolerance than males. Torgen et al., (37) indicated that tension pain threshold levels improved with the muscular strength, and Chiu et al., (17) noticed that the isometric muscular strength of the neck is 1.2-1.7 times that of female in all directions for male. Moreover, Yue et al., (12) found that females bear heavier housework in daily routines than males and as well as some researchers suggest that household role involvement differentials may clarify disparities in WMSDs between male and females (34). In addition, gender persisted positively associated with wrist/hand impaired MSDs (21). In this research, the incidence of low back pain (48.1%) by female teachers was significantly higher than by men (39.6%) (19). Previous studies indicated gender differences that women were more likely to experience pain symptoms than men because women appeared to have lower pain levels than men (17,38).

Length of Employment

Teachers who complaint of low back pain are those who have been teaching in Bentong, Pahang at secondary school for over a year. There are many low back pain among school teachers in Bentong, Pahang. Prolonged standing (23.4%) is the highest risk factor. Physical exertion while teaching, prolonged standing for several

hours inside the classroom in an awkward posture generally results in back pain and musculoskeletal pain among teachers, all teachers stand the same posture in long time led to lower back pain growth (30). The length of the works (years of experience) affected the occurrence of WMSDs among teachers. Study by Vaghela and Parekh (1) showed that age and length of employment are highly correlated, so specifically distinguishing their influence is challenging. Prolonged standing was closely associated with neck-shoulder pain (NSP). Moreover, Gendy and Korish (22) stated that teaching experience and number of class per day were not related to back, upper limb disorders but were related to lower limbs disorders. Mohseni Bandpei et al.'s study (29) also showed that period of employment has been one of the risk factors associated with low back pain, which is the greater risk of low back pain the longer the years of period teaching. In essence, the duration of employment seemed to be correlated with the prevalence of low back pain.

Ergonomics Applications and Intervention for MSDs

Ergonomic approaches have emerged in the last decade as the most common research tool and a vital component of the workforce policy of safety and health. Prevention is the fundamental principle of the philosophy of occupational health and safety (OHS) to mitigate environmental hazards and reduce workplace injuries and illness at work. Ergonomic approach or intervention is the use of ergonomics to reduce disabled workers' injury and is defined as human, institutional, physical and psychosocial ergonomic interventions (39). Workers' role in choice-making, exchanging information, and awarding from leadership to lower institutional rates has been seen as ergonomic engagement. Ergonomic approach or interventions can be classified into individual, physical ergonomic, organizational ergonomic and combined ergonomic intervention. Physical ergonomic intervention tackles the most significant physical risk factors such as lifting loads, excessively physical work, prolonged posture, repeated movements, repeated shoulder, wrist and finger turning and twisting (39). There are an easiest and inexpensive way from ergonomics knowledge when it comes to achieve better health. The International Ergonomic Association describes ergonomics as 'the scientific discipline associated with recognizing the relationships between humans and other components of a system, and a practice that implements philosophical theories, information and development techniques to improve the human being and the entire system' (40). There are variety of approaches in the place of work to minimize or decreasing the incidence of musculoskeletal disorders by workers. Expanding ergonomic awareness and using strategies across workers is a fast way to prevent musculoskeletal disorders. Every ergonomic procedure was intended to improve the health of the employee. Researchers have been working hard to identify the right ergonomic approaches to date. As

a result, they examined the effects on health and performance. Every ergonomic reform will be followed by the development of methods that are expected to lead to the transition that will be effective (41). Ergonomic approaches and interventions are named to improve system and process by utilizing knowledge of ergonomics. Ergonomic techniques have become more common and are one of the several suggested treatments for work-related musculoskeletal conditions treatment and prevention. This review has found a wide range of different ergonomic and non-ergonomic approaches among workers to reduce musculoskeletal disorders (MSDs) (Table II).

On the basis of the effective interventions mentioned in this review, it can be inferred that the most widely utilized interventions are primary and secondary ergonomic interventions which among them are physical ergonomic intervention (PEI), combined ergonomic intervention (CEI) and organizational ergonomic intervention (OEI) and finally individual ergonomic intervention (IEI). Improvements in working postures or training exercise plan were the key practical

TABLE II: Ergonomic and Non-Ergonomic Interventions for Musculoskeletal Disorders (MSDs)

Ergonomic Interventions (39,40,41,42,43,45,46,47,48,49,50,51)	Non-Ergonomic Interventions (44)
Educational Programme 1) Occupational health education lectures 2) On-site ergonomics training 3) Publicity brochure and poster 4) Exercise and physical programme	Primary Care 1) Early diagnosis 2) Appropriate Referral 3) Medical Check-up
Workplace Adjustments 1) Reduce hazard at workplace condition	Secondary Care 1) Treatment and work ability care
Ergonomic Methods 1) Rapid Upper Limbs Assessment 2) Rapid Entire Body Assessment (REBA) 3) Strain Index 4) Participatory Ergonomics	Employee behavior 1) Self-Management 2) Counselling
Questionnaire 1) Nordic Musculoskeletal Disorders Questionnaire (NMQ) 2) Borg's Scale Questionnaire 3) Dutch Musculoskeletal Questionnaire 4) Ergonomic Questionnaire 5) Corlett and Bishop's Body Questionnaire 6) Work-related Upper Extremity Musculoskeletal Symptoms (WUEMSS)	
Health Assessment 1) Electromyography 2) Ergonomic Assessment Tool for Arthritis 3) Physiotherapist 4) Cartesian Optoelectronic Dynamic Anthropometric CX-1 (CODA)	
Lifting Loads 1) Material Handling at Lifting Loads	
Design 1) Ergonomic Footwear 2) Ergonomic Insoles 3) Anti-Fatigue Mat 4) Foot Massager 5) Ergonomic Chair 6) Tools modification	

ergonomic strategies. Primary ergonomic organizational interventions focused on organizational level issues such as restructuring the workplace or using new equipments or support units. Combined interventions make full use of several interventions. For instance, corrections in working position, physical and combined ergonomic interventions have been used in the medical field, administrative initiatives were introduced to factory workers, and for software staff, body alignment and workstation adjustments were used to reduce the risk of MSDs (41). A well-known forms for ergonomic intervention such as electromyography, Borg's Scale Discomfort and Nordic Musculoskeletal Disorders Questionnaire can be applied to school teachers that exposed to prolonged standing during school hours. Electromyography (EMG) can provide real time analysis on muscle fatigue or discomfort in order to support individual perception on body parts by using Borg's Scale and Nordic Musculoskeletal Disorders Questionnaire. These ergonomic interventions as well as experimental methods can be assessed in a very convenient way and the result can be interpreted as health assessment for school teachers. Typically, the questionnaires were used in pre- and post-intervention studies in order to determine the prevalence of MSDs among workers. For instance, in China, ergonomic training was carried out between computer workers in a clinic and local hospital. Muscle function was assessed by electromyography (EMG) method on 72 computer staff. For post-intervention, average pain in the biofeedback group was reduced significantly more than in the other non-training groups. 6 months of this training followed. Significant reduce on muscle activity in the cervical part of m. erector spinae and bilaterally in m. trapezius superior was analysed in the biofeedback group (42). Hence school teachers that exposed to prolonged standing may adapted well with these interventions and assessed without disturbing the real movement and posture during lesson in classroom.

CONCLUSION

In summary, prolonged standing working position may contribute to bodily pain, discomfort and even health problems specifically upper extremity musculoskeletal disorders (UEMD) and lower extremity musculoskeletal disorders (LEMD). Therefore, keeping the static and awkward working position during school hours for more than 2 hours is not advised and lead the condition of the body become worse. Factors such as age, gender and length of employment must be taken into account as these factors that are linked to the level of pain correlated with prolonged standing to teachers individually. Therefore, implementing ergonomic interventions have become a common way of describing employee changes and improvements in terms of health, posture and awareness to always be in a good condition of the body while working.

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