Ergonomics and occupational safety and health: An ILO perspective

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A R T I C L E   I N F O

Article history:
Received 10 February 2009
Accepted 3 March 2010

Keywords:
Occupational safety and health
Musculoskeletal
International conventions and recommendations
Ergonomic

A B S T R A C T

The ILO has a mandate to protect workers against sickness, diseases and injuries due to workplace hazards and risks including ergonomic and work organization risk factors. One of the main functions for the ILO is to develop international standards related to labour and work. ILO standards have exerted considerable influence on the laws and regulations of member States. The ILO standards take the form of international Conventions and Recommendations. ILO Conventions and Recommendations relevant to protection of workers against ergonomic risk factors at the workplace include Convention No. 127 and Recommendation No.128 which specify the international requirements concerning the manual transport of a load. To help member States in applying the ILO standards, the ILO produces practical guides and training manuals on ergonomics at work and collects and analyses national practices and laws on ergonomics at the workplace. The ILO also conducts technical cooperation activities in many countries on ergonomics to support and strengthen the capacities of its tripartite constituents in dealing with workplace ergonomic and work organization risks. The ILO’s technical cooperation activities give priorities on the promotion of voluntary, participatory and action-oriented actions to improve working conditions and work organizations of the small and medium sized enterprises. This paper reviews ILO’s policies and activities on ergonomics in relation to occupational safety and health and prescribes ILO’s considerations for its future work on ergonomics.

1. Introduction

The International Labour Organization estimates that each year around 2.3 million workers die as a result of occupational accidents and work-related diseases. A latest estimate based on 2003 data indicates that fatal occupational accidents are about 358,000 every year. Across the globe, there are some 337 million occupational accidents and 160 million occupational diseases each year. Fatal work-related diseases are around 1.95 million per year (Al-Tuwaijri et al., 2008).

The economic costs of occupational safety and health problems place a considerable burden on the competitiveness of both the member States and the enterprises. For example, the annual cost of accidents in the manufacturing sector of the United States is more than 190 billion US dollars. The direct cost of work accidents and diseases is estimated around 40 billion NOK in Norway and £19 billion in the United Kingdom. A study by the European Commission estimates that the costs of occupational accidents alone in the EU15 (15 European Union Member States) in year 2000 were €55 billion a year (European Commission, 2004). It is estimated that the annual losses resulting from work-related diseases and injuries, in terms of compensation, lost of productivity, premium of insurance and medical expenses, etc. on average amount to over 4 per cent of the total gross national product of all the countries in the world (Takala and Niu, 2003). The ILO estimate is based on a selected compensation system which takes only a fraction of work-related cancer into account — as they are usually neither properly recorded nor compensated. Furthermore, work-related communicable diseases have not been recorded at all. Thus the financial losses could finally rise even up to 10–15% of the country’s national product if all the factors are taken into account.

2. Ergonomic problems at the workplace

Ergonomic problems at the workplace and bad work organization are part of the contributing risk factors to the above-mentioned occupational safety and health problems. A number of situations within the workplace are conjectured to contribute to the increasing magnitude of musculoskeletal disorders (MSDs) suffered by the workers, including postural stress from prolonged sitting, standing, or awkward position; stereotyped and repetitive tasks leading to chronic injury; peak overload injuries to the axial or peripheral skeleton; environmental factors; and psychosocial...
factors including psychological stresses, job dissatisfaction, and complex social issues, such as compensation laws and disability system (Frymoyer and Mooney, 1986).

The upper-extremity musculoskeletal disorders have been recognized to occur in relation to work for hundreds of years. They were described by Bernardini Ramazzini, an Italian physician and father of occupational medicine, in the 18th century, when he said the diseases: “...arise from three causes: first constant sitting, the perpetual motion of the hand in the same manner, and thirdly the attention and the application of the mind...” (European Foundation for the Improvement of Living and Working Conditions, 1994). The first recorded epidemic of work-related musculoskeletal disorders in the UK occurred in the civil service in the 1830s and was associated with the introduction of the steel nib. The report of an enquiry into a subsequent epidemic in the early 1900s, among the telegraphists, has been suggested by Lucire to be the origin of the term “nervous breakdown” (Lucire, 1986).

Repeated or forceful efforts, sustained static loading, anatomically non-neutral posture, accelerated movements, externally applied compressive forces and vibration can affect musculoskeletal, nerve and circulatory tissues. Exposure to each of these ergonomic factors causes MSDs in one or more body regions. The risk is especially noticeable when a job includes exposure to a combination of two or more of these risk factors. Exposures of high intensity or long duration increase the risk of MSDs. Available exposure-response data show that work related MSDs may occur even when workers are exposed to an occupational risk factor on an occasional basis or for a 25% or less of the day (Punnett, 2000).

Adverse ergonomic working conditions can cause visual, muscular and psychological disturbances such as eye strain, headaches, fatigue, MSDs such as chronic back, neck and shoulder pain, Cumulative Trauma Disorders (CTDs), Repetitive Strain Injuries (RSIs) and Repetitive Motion Injuries (RMIs), psychological tension, anxiety and depression. Psychosocial factors that result from the organization of work are considered to have impacts on the development of MSDs. Psychological job demands, decision latitude and social support are three key measures of psychosocial factors at the workplace affecting workers’ health (Karasek et al., 1981, 1988). High psychological job demands in combination with low decision latitude may not only result in residual job strain but also cause chronic adverse health effects such as cardiovascular diseases if exposure is prolonged (Karasek and Theorell, 1990). Work organization, working time arrangement, different work schedules (day work versus various types of shift work), working hours and overtime can also produce negative impacts on the health of workers. Transitions in work time arrangements are related to changes in health (De Raeeve et al., 2007). Working long hours or over time has been shown to be associated with poor subjective health, more injuries, unhealthy behaviour, and increased morbidity and mortality (Harrington, 1994; Sparks et al., 1997; Spurgeon et al., 1997; van de Hulst, 2003; van Amelsvoort et al., 2004).

Work-related MSDs cause chronic pain and functional impairment. Ergonomic related injuries and illnesses can be temporary and may disappear when the individual is removed from work or given an opportunity to rest at work, or when the working conditions are improved. Ergonomic related injuries and illnesses can also be permanent if exposures to poor ergonomic working conditions are prolonged (Morse et al., 2005; Scientific Committee for MSDs of the ICoH, 1996).

MSDs are one of the most common health problems caused by adverse ergonomic working conditions affecting tens of millions of workers across all employment sectors. The fourth European working conditions survey in 2005 (EWCS, 2005) (Fourth European Working Conditions Surveys (225), 2005) revealed that MSDs are the most common work-related problems in the EU-27 countries: 25% of European workers complain of backache and 23% of muscular pains. In terms of exposure to physical risks a quarter or more of the time, 62% of respondents are exposed to repetitive hand and arm movements; 45% report working in painful or tiring positions; 35% are required to handle heavy loads in their work. For certain risks, prevalence is higher amongst female workers, notably in education and health. For instance, 11% of women say their job requires them to lift or move people a quarter or more of the time, compared to 6% of men.

Musculoskeletal complaints are a major cause of absence because of sickness in developed countries; they are second only to respiratory disorders as a cause of short-term sickness absence (less than two weeks) (Woolf and Pfleger, 2003). Musculoskeletal complaints are the most common medical causes of long term absence, accounting for more than half of all sickness absences lasting longer than two weeks in Norway (Brage et al., 1998). McDiarmid et al. (2000) studied 29,937 workers lost time from work due to carpal tunnel syndrome in 1996 and found that half of those were out for more than 25 days, compared with a median of 5 days for all injuries/illnesses.

In the United States, work-related MSDs comprise well over half of all reported occupational illnesses (OSHA, 2002). At any one time, 30% of American adults are affected by joint pain, swelling, or limitation of movement (The Consensus Document, 1998). According to the United States Bureau of Labour Statistics, about 1/3 of all occupational disorder cases are due to overexertion or repetitive movements. Musculoskeletal conditions cause more functional limitations in the adult population in most welfare states than any other group of disorders. They are a major cause of years lived with disability in all continents and economies (Woolf and Pfleger, 2003). MSDs also are common reasons for people claiming disability pensions. In Sweden, up to 60% of people on early retirement or long term sick leave claimed MSDs as a reason (Swedish National Board on Health and Welfare, 2001). In Norway, low back disorders were the most common reason for people claiming disability pensions (National Insurance Administration, Oslo: Norway, 1998).

The cost of work related MSDs is immense; it was estimated to correspond to USD 13 billion in the United States and the US Department of Labour had estimated overall costs at nearly US$ 100 billion a year when such factors as lost work time, lost productivity and retraining costs are added (NIOSH, 1996). The cost of MSDs were estimated to have ranged from 2.7% to 5.2% of the gross national product (GNP) in Nordic countries in 1991, at a time when all costs due to illness were estimated to range from 15.8% to 22.2% of the GNP (Hansen, 2003). An attempt to evaluate the etiologic fraction of musculoskeletal disorders due to work resulted in an estimate ranging from 15% to 49%. It was predicted that in UK by 2030 there will be a 9% increase in MSDs, affecting more than 7 million workers and a 5% rise in the rate of mental illness in the workforce to affect 4.2 million employees (Vaughan-Jones and Barham, 2009).

The true magnitude of MSDs at the workplace is unknown. The problem of underreporting through administrative databases is a known fact. The reasons for underreporting by employers and by workers likely include (Rosenman et al., 2000; Michaels, 1998; Park et al., 1992; Pransky et al., 1999):

- Failure to recognize work-relatedness
- Concern about job security
- Workplace incentives for supervisors to discourage reporting
- Employee preference to avoid the workers' compensation system and obtain medical care coverage through private insurance
3. The ILO’s response to ergonomic and safety and health problems at work

3.1. ILO policy and strategy on ergonomics and occupational safety and health

The ILO has a tripartite structure which is unique in the United Nations, in which employers’ and workers’ representatives have an equal voice with those of the governments in shaping ILO’s policies and programmes. The ILO has a mandate to protect workers against sickness, diseases and injuries due to workplace hazards and risks including ergonomic and work organization risk factors. One of the main functions for the ILO is to develop international standards related to labour and work. The ILO standards take the form of international Conventions and Recommendations. As a package, they constitute the International Labour Code which defines minimum standards in the labour and social fields. Since the establishment of the ILO in 1919, 188 Conventions and 199 Recommendations have been adopted. Almost half of them relate directly or indirectly to occupational safety and health (OSH). All major hazardous sectors and key hazards are covered by ILO Conventions, Recommendations and codes of practice. The most important ILO OSH Conventions are No. 155 on Occupational Safety and Health, No. 161 on Occupational Health Services, No. 81 on Labour Inspection and No. 187 on the Promotional Framework for Occupational Safety and Health.

Conventions are comparable to multilateral international treaties; they are open to ratification by member States and, once ratified, become binding obligations. A government that has ratified a Convention is expected to apply its provisions through legislation or other appropriate means as indicated in the text of the Convention. The government is also required to report regularly on the application of ratified Conventions. The extent of compliance is subject to examination by ILO machinery. Complaints about alleged non-compliance may be made by the governments of other ratifying States or by employers’ or workers’ organizations and procedures exist for investigating and acting upon such complaints. Conventions that have not been ratified have the same value as Recommendations.

Recommendations are intended to offer guidelines for action by member States. Often, a particular Recommendation will elaborate upon the provisions of a Convention on the same subject. Member States have certain important procedural obligations in respect of Recommendations – namely, to submit the texts to their legislative bodies, to report on the action resulting therein, and to report occasionally at the request of the ILO Governing Body on the measures taken or envisaged to give effect to the provisions, but no specific substantive obligations are entailed.

ILO standards have exerted considerable influence on the laws and regulations of member States. Many texts have been modelled on the relevant provisions of ILO instruments. Drafts of new legislation or amendments are often prepared with ILO standards in mind so as to ensure compliance with ratified Conventions or to permit the ratification of other Conventions. Trade unions use ILO standards to support arguments in bargaining and in promoting legislation. Governments frequently consult the ILO, both formally and informally, about the compatibility of proposed legislative texts with international labour standards.

In response to the grim picture of the global occupational safety and health problems including the increased concern with the workplace ergonomic problems and work-related MSDs in both developed and developing countries, the ILO adopted a Global Strategy on Occupational Safety and Health at the 91st Session of the International Labour Conference in 2003 (ILO, 2003) which reaffirmed the importance for all countries to apply international labour standards on occupational safety and health. The Global Strategy requested the ILO to give highest priority to the development of new instruments in the areas of ergonomics and biological hazards.

The Global Strategy on Occupational Safety and Health was designed to progressively improve safety and health in the world of work. In response to this strategy, the International Labour Conference adopted the Promotional Framework for Occupational Safety and Health Convention (No. 187) and its accompanying Recommendation (No. 197) in 2006. The main purpose of Convention No. 187 is to ensure that a higher priority is given to OSH in national agendas and to foster political commitments in a tripartite context for the improvement of working conditions and environment. It has a promotional rather than prescriptive content and is based on two fundamental concepts outlined in the above Global Strategy, namely to develop a preventative safety and health culture and to apply a systems approach to managing OSH nationally. This means the continual monitoring, evaluation and improvement of all the different “building blocks” making up the national OSH system. The Convention defines in general terms the elements and function of the national policy, the national system and the national programme. Further specific areas of action, operational details and mechanisms such as the development and maintenance of a national OSH profile are provided in the Recommendation.

A national preventative safety and health culture is one in which the right to a safe and healthy working environment is respected at all levels. It is also one where governments, employers, workers and other interested stakeholders actively
participate in securing a safe and healthy working environment through a system of defined rights, responsibilities and duties, and where the principle of prevention is accorded the highest priority. Building and maintaining such a culture require a permanent mobilization of all available means of action, particularly education and training, to increase general awareness, knowledge and understanding of the concepts of hazards and risks and how they may be prevented and controlled. Educational systems need to recognize the concepts of workplace hazards, risks and prevention, including them within national curricula as appropriate, thereby promoting greater continuity between public and workplace safety and health issues.

Conventions and Recommendations relevant to protection of workers against ergonomic risk factors at the workplace include Convention No. 127 and Recommendation No. 128 which specify the international requirements concerning the manual transport of a load which by reason of its weight is likely to jeopardise a worker’s health or safety and the necessary measures needed to protect the workers including women and young workers who are engaged in manual transport of loads other than light loads.

The List of Occupational Diseases, which forms the Annex to the List of Occupational Diseases Recommendation, (No. 194) adopted at the International Labour Conference in 2002, is a very useful instrument for countries wishing to strengthen their national OSH systems as well as tackling the more serious occupational diseases. This list includes a specific section on occupational MSDs:

**Occupational musculoskeletal disorders**

Musculoskeletal diseases caused by specific work activities or work environment where particular risk factors are present. Examples of such activities or environment include:

- (a) rapid or repetitive motion
- (b) forceful exertion
- (c) excessive mechanical force concentration
- (d) awkward or non-neutral postures
- (e) vibration

Local or environmental cold may increase risk

Occupational MSDs have been recognized by a number of countries e.g. Algeria, Australia, Bangladesh, Belgium, Canada, China, Colombia, Denmark, Finland, France, Italy, Japan, Republic of Korea, Latvia, Lithuania, Luxembourg, Malaysia, Poland, Portugal, Spain, Switzerland, United Kingdom. MSDs are also included in the 2003 European schedule of occupational diseases. Replies to an ILO survey in 2005 in all its 176 member States at that time on the list of occupational diseases indicated that the majority respondents were in favour to include in the list specified MSDs. The majority responders also emphasized the importance for the ILO list to include only those diseases whose causality link with exposures at the workplace could be established scientifically or determined by other means as appropriate by the national competent authorities (ILO, 2005).

Work to revise the List began in 2005 and the ILO Governing Body decided to convene a Meeting of Experts in 2009 to complete the work. Development and experiences on the criteria to evaluate MSDs over the years have provided a good basis for the ILO to progress on a more specific listing of the commonly seen occupational MSDs. The classification of MSDs and the establishment of diagnostic criteria are challenges in clinical practice and, accordingly, in epidemiological studies. For some disorders, such as carpal tunnel syndrome and epicondylitis, the diagnostic criteria are fairly well established, whereas for tendon disorders (tenosynovities, peritendinitis) the diagnostic criteria are more difficult to define. Perhaps most problems are encountered with back and neck disorders, for the majority of which the classification relies mainly on symptom reporting (Wairs et al., 1979; Rempel et al., 1998; Rihimäki, 1999). A useful source of information on the criteria for evaluating the work-relatedness of upper-extremity musculoskeletal disorders is the criteria document prepared by Judith K Sluiter and her co-authors (Sluiter et al., 2001). MSDs currently being considered by the ILO to be specified in the revised ILO’s list of occupational diseases include:

**Occupational musculoskeletal disorders**
- Radial styloid tenosynovitis due to repetitive movements, forceful exertions and extreme postures of the wrist
- Chronic tenosynovitis of hand and wrist due to repetitive movements, forceful exertions and extreme postures of the wrist
- Olecranon bursitis due to prolonged pressure of the elbow region
- Prepatellar bursitis due to prolonged stay in kneeling position
- Epicondylitis due to repetitive forceful work
- Meniscus lesions following extended periods of work in a kneeling or squatting position
- Carpal tunnel syndrome due to extended periods of repetitive forceful work, work involving vibration, extreme postures of the wrist, or a combination of the three
- Other musculoskeletal disorders not mentioned in the preceding items where a direct link is established scientifically or determined by methods appropriate to national conditions and practice between exposure to the risk factors arising from work activity and the musculoskeletal disorders contracted by the worker

### 3.2. ILO’s programmes and activities on ergonomics and occupational safety and health

The ILO’s SafeWork (2002) Programme responds to safety and health problems at work at the global level. Its primary objectives are to create worldwide awareness of the dimensions and consequences of work related accidents and diseases; to promote the goal of basic protection for all workers in conformity with international labour standards; to enhance the capacity of member states and industries; and to design and implement effective preventive and protective policies and programmes.

The problem is more on the implementation side and, in particular, in developing countries. Two major strategies have been identified for enhanced application and implementation of ILO standards:

- The “Integrated Approach to standard-related activities” aimed at streamlining all the means of action of the ILO, including standard-setting, codes and guidelines, technical cooperation, international cooperation, statistical analysis and information dissemination towards a more effective implementation of occupational safety and health requirements by member States.
- The use of voluntary measures and, in particular, wide use of the ILO’s Guidelines on Occupational Safety and Health Management Systems (ILO-OSH 2001). The target is to establish a proper safety culture at both the national level and the level of the organization (enterprise). In this regard, the governments have a role in supporting such management systems and establishing a national framework for the promotion of these systems.

A common definition of occupational health was adopted by the Joint ILO/WHO Committee on Occupational Health at its First
Session (1950) and revised at its 12th Session (1995) which states that occupational health should aim at:

i. the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations;

ii. the prevention amongst workers of departures from health caused by their working conditions;

iii. the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of workers in an occupational environment adapted to their physiological and psychological capabilities; and, to summarize, the adaptation of work to the workers and of each worker to his or her job.

The main focus in occupational health is on three different objectives:

i. the maintenance and promotion of workers’ health and working capacity;

ii. the improvement of working environment and work to become conducive to safety and health; and

iii. the development of work organizations and working cultures in a direction which supports health and safety at work and, in doing so, also promotes a positive social climate and smooth operation, and may enhance the productivity of the enterprises. The concept of working culture is intended in this context to mean a reflection of the essential value systems adopted by the enterprise concerned. Such a culture is reflected in practice in the managerial systems, personnel policy, principles for participation, training policies and quality management of the enterprise.

Ergonomics, a term that first surfaced in the 1940s, is the science of adapting work and working conditions to the physical needs of the workers rather than requiring the worker to adapt to the inadequately designed working environment. Ergonomics is an essential and integral part of occupational health practice. According to the International Ergonomics Association (IEA):

“Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and their environments (systems) and the profession that applies theory, principles, data and methods to design in order to optimize human wellbeing and overall system performance.” (definition adopted by the IEA Council in August 2000 (http://www.iea.cc/ergonomics/))

Ergonomics is a field which integrates knowledge derived from the human sciences in particular anatomy, physiology and psychology to match jobs, systems, products and environments to the physical and mental abilities and limitations of workers. Ergonomics stresses fitting the job to the worker as compared to the more usual practice of obliging the worker to fit the job. The aim of ergonomics is to optimize, first and foremost, the comfort of the worker, as well as his or her health, safety and efficiency.

It has been estimated that at least 50% of all work-related MSDs among the working population could be prevented by appropriate ergonomic job design (Snook et al., 1978; Snook, 1987). Preventing ergonomic problems and MSDs and obtaining optimal performance can be achieved when equipment, workstations, products and working methods are designed according to human capabilities and limitations, that is by applying the principles of ergonomics. The most effective intervention programmes seem to be those with multiple, coordinated activities, including workstation improvement, provision of adjustable furniture, training to facilitate workers’ knowledgeable adjustment of work-stations and work schedules, and enhanced medical surveillance and management systems (Bernacki et al., 1999; Brisson et al., 1999; Johanning, 1998; Keyserling et al., 1993; Kuorinka et al., 1995; Laitinen et al., 1997; Mansfield and Armstrong, 1997; Melhorn et al., 1999; Shi, 1993). Work organizational factors such as general workforce empowerment and top management’s active leadership plus delegation of decision-making authority regarding occupational safety are consistently associated with lower injury rates (Shannon et al., 1997).

Applying ergonomic principles, however, is beneficial not only to the workers. The benefits to employers are equally significant. Healthy employees can be nearly three times more productive than those in poor health. These benefits to the workers and employers are both visible and measurable. The costs of ignoring these basic principles might include (Rosskam and Baichoo, 1997; Oxenburgh, 1991; Leigh et al., 1997; Yelin et al., 1995; Levenstein, 1999; Morse et al., 1998).

For employers:

- Increased absenteeism and lost working time
- Adverse effects on labour relations
- Higher insurance and compensation costs
- Increased probability of accidents and errors
- Restriction, job transfer and higher turnover of workers
- Scrap and decreased production
- Lawsuits
- Low-quality work
- Less spare capacity to deal with emergencies
- High administrative and personnel costs.

For workers:

- Pain and suffering due to injuries and occupational diseases (including RSI, CTD and RMI)
- Medical care cost
- Lost work time
- Lost future earning and fringe benefits
- Reduced job security and career advancement
- Lost home production and child care
- Home care costs provided by family members
- Adverse effects on family relations,
- Lost sense of self-worth and identity
- Adverse effects on social and community relationships
- Adverse effects on recreational activities.

3.3. ILO’s technical cooperation activities on ergonomics at the workplace

ILO’s technical cooperation activities on ergonomics have been focused on the promotion in the member States of voluntary, participatory and action-oriented actions to improve working conditions and work organizations of the small and medium sized enterprises. To this end, two training packages promoted by the ILO are being widely applied in particular in Africa, Asia and Latin America. The first training package is “Work Improvements in Small Enterprises” — WISE (ILO and WISE). WISE, also known as “Higher Productivity and A Better Place to Work”, is aiming at assisting small and medium-sized enterprises in improving their working conditions and productivity by using simple, effective and affordable techniques that provide direct benefits to owners and workers. The second package is “Work Improvement in Neighbourhood Development” — WIND (ILO and WIND; Kawakami et al., 2008). WIND is a programme aiming at promoting practical improvements in agricultural households by the initiatives of village families.
Since the first publication in 1988 of the action manual and trainers’ manual “Higher Productivity and A Better Place to Work”, the WISE programme has resulted in improvements in small-scale industries in over 20 countries in Asia and the Pacific, Latin America and Africa. A Chinese version of WISE was published in 2008. WISE methodology has been integrated into China’s national Basic Occupational Health Services (BOHS) programme. Tailor made industry specific practical guides and manuals based on WISE approaches have been developed for the small and township enterprises engaged in the following manufactury and production industries: rechargeable battery, furniture, bags and suitcases, gemstone processing, pharmaceuticals, stone quarry and processing, welding, coal mining, chemicals, paints, etc. The application of these guides and manuals has been promoted by the Ministry of Health in provinces/municipalities such as Shandong, Guangdong, Shanghai, Hebei and Fujian where large number of small and township enterprises exist.

The WISE programme is based on six basic training principles: build on local practice, focus on achievements, link working conditions with other management goals, use learning-by-doing, encourage exchange of experience and promote workers’ involvement.

The WISE programme makes use of action-oriented checklists that small business owners and managers can use themselves to identify opportunities for cost-effective improvements and to plan their implementation. A companion book published by the ILO on Work Organization and Ergonomics (Di Martino and Corlett, 1998) provides action-oriented ideas for more advanced enterprises. This publication draws together some of the basic changes being applied by enterprises around the world and explains briefly what they are and how an enterprise may start to benefit from them.

The WISE approach has been institutionalized in the Philippines following a UNDP-financed project there. This experience, besides assisting hundreds of small enterprises to improve their conditions, also assisted the Philippines labour legislation system to develop practical strategies for intervening to achieve improved working conditions in small-scale and micro enterprises.

The ILO’s WIND programme is based on the WISE methodology and applies the same principles and approaches. It was first developed by the ILO together with other organisations in Viet Nam. It is currently being adapted to local conditions, translated and pilot-tested in Ethiopia, Kyrgyzstan, Moldova and Senegal, in collaboration with the national social partners and other local organisations. WIND has also been translated into Chinese and is being promoted in several pilot provinces in China in conjunction with the implementation of the Basic Occupational Health Services (BOHS).

The WIND programme promotes practical improvements in agricultural households by the initiatives of village families. Agricultural workers account for a particularly high proportion of unprotected workers, especially in developing countries. Their work is generally heavy, their working hours can be very long, they are often exposed to difficult climatic conditions, and many are exposed to hazardous chemicals, especially pesticides. These problems are compounded by poverty: living conditions are often extremely poor, and many have limited access to clean water, fuel and power, adequate shelter and nutrition. Literacy is often low. Organization of workers is low.

The uniqueness of the WIND approach lies in improving both working and living conditions as inter-related aspects of rural life, ensuring the equal involvement of village men and women together in planning and implementing improvements and its close links with community development and empowerment of agricultural workers and farmers. The methodology is being developed to maximize use of existing mechanisms in rural areas, including organizations of agricultural workers as well as local health services, and to minimize the cost of intervention, especially the need for expertise external to the local area.

3.4. ILO’s cooperation with the IEA

An important characteristic of the ILO’s work in occupational safety and health in relation to ergonomics at work is collaboration. Traditional links with governments, employers and workers and their organizations are complemented with partnerships and alliances. Collaboration on ergonomics includes cooperation with other UN and international organizations such as WHO and professional organizations, such as IEA, IC0H and IOHA. The national safety and health councils and institutes and professional bodies are equally logical counterparts.

The ILO has had a long history of fruitful cooperation with the IEA to promote sound workplace ergonomic principles at the international level. The Ergonomic Checkpoints jointly developed by the IEA and the ILO has been a good example. This manual was firstly published by the ILO in 1996 (ILO and IEA, 1996). It has been translated into many languages and been widely used in many countries. The checkpoints in this manual are based on numerous examples of practical ergonomic improvements achieved at low cost and provide simple, practical and inexpensive solutions to ergonomic problems at the workplace applicable across a wide range of local situations. Due to its simple and easy to understand format, the manual Ergonomic Checkpoints can be used by managers, supervisors, workers, and trainers, as well as ergonomics specialists who wish to learn about low-cost practical solutions to ergonomic problems which can be applied locally.

The coverage of the checkpoints extends to all the main ergonomic issues which include: materials storage and handling, hand tools, machine safety, workstation design, lighting, premises, control of hazardous substances and agents, welfare facilities and work organization. The manual’s 128 checkpoints provide sound guidance for filtering and disseminating economically sound workplace improvements. An ergonomics checklist is included in the book. Special considerations have been given to the identification of practical solutions to ergonomic problems in each local situation where priority issues vary greatly. The solutions provided have the advantage of being fully illustrated to demonstrate good workplace practice and will surely contribute to improve both working conditions and productivities. The ILO is currently updating this publication in close collaboration with the IEA.

A similar endeavour is being taken in the field of ergonomics in agriculture. The ILO and IEA are collaborating to prepare a practical manual on Ergonomic Checkpoints in Agriculture. A first draft Ergonomic Checkpoints in Agriculture has been reviewed by an international experts panel assembled by the IEA and ILO and it is expected that this manual will be completed and published by the ILO in the course of 2010—2011.

In response to the ILO Global Strategy on Occupational Safety and Health and with a view to developing an international instrument on ergonomics, the ILO is collaborating with the IEA in collecting national practices, regulations, standards and laws on ergonomics at the workplace. Contracted by the ILO, the IEA established an experts group led by Dr. Wendy Macdonald and her colleagues from the Faculty of Health Sciences, La Trobe University, Melbourne, Australia. The IEA experts group undertook an extensive search to obtain copies of Ergonomics Standards, Codes and Guidelines which have a primary focus on the prevention of work-related MSDs and which have international or national status. For countries in which jurisdictional authority for the prevention of work-related MSDs rests at state or provincial level (USA, Canada, Australia), they sought documents at that level also.
The following documents were collected and analyzed:

**Australia**
- Code of Practice for Manual Handling 2000 — Victoria

**China**
- Occupational exposure limits for hand-transmitted vibration in the workplace (GBZ 2.2-2007), Measurement methods (GBZ/T 189.9), and Diagnostic criteria of occupational hand-arm vibration disease (GBZ 7)
- Hygienic Standards for the Design of Industrial Enterprises (GBZ1) on workplace lighting and illumination
- Guidelines for occupational hazards prevention and control (GBZ/T 211-2008)

**European Community**
- Directive 89/391 Introduction of measures to encourage improvements in the safety and health of workers at work
- Directive 90/269/EEC Minimum health and safety requirements for the manual handling of loads where there is a risk particularly of back injuries to workers
- Directive 2002/44/EC Minimum health and safety requirements regarding the exposure of workers to the risks arising from the use of physical agents (vibration)

**ISO**
- ISO 11228-1 Ergonomics — Manual Handling — Part I: Lifting and Carrying
- ISO 11226 Ergonomics — Evaluation of static working postures

**Japan**

**Netherlands**
- Working Conditions Act 1998

**New Zealand**
- Code of Practice for Manual Handling
- Approved Code of Practice for the Use of Visual Display Units in the Place of Work

**Norway**

**South Africa**
- Occupational Health and Safety Act 1993

**Spain**
- Royal Decree 487/1997 Minimum health and safety provision relating to manual load handling involving risks for workers, particularly to the dorsiolumbar region and the associated technical guide for the evaluation and prevention of risks associated with manual load handling.
- Royal decree 488/1997 Minimum health and safety dispositions relating to work with equipment fitted with visual display units and the associated technical guide for the evaluation and prevention of risks associated with the use of equipment with visual display units.

**Sweden**
- AFS 1998:1 — Provisions of the Swedish National Board of Occupational Safety and Health on Ergonomics for the Prevention of Musculoskeletal Disorders, together with the Board’s General Recommendations on the implementation of the Provisions

**UK**
- Upper limb disorders in the workplace. HSE, 2002
- Aching arms (or RSI) in small businesses, HSE, 2003

**USA**
- NIOSH: Simple Solutions: Ergonomics For Farm Workers, 2001
- California Dept of Industrial Relations, 1999: Easy Ergonomics. A Practical Approach for Improving the Workplace
- California Dept of Industrial Relations, 2000: Fitting the Task to the Person: Ergonomics for Very Small Businesses
- State of Washington, Dept of Labor: Fitting the Job to the Worker: An Ergonomics Program Guideline

The analysis of the above collected documents was focused on the nature of the discipline of ergonomics and its various roles within the domain of occupational safety and health and the role of ergonomics in the prevention of work-related MSDs. On this basis, the IEA experts group evaluated the content of existing national and international ergonomics standards, codes and guidance materials related to work-related MSD prevention. The group prepared a preliminary draft report — “Ergonomics Approaches to the Prevention of Work-Related Musculoskeletal Disorders - An Analysis and Critical Review of Existing National, and Regional Standards and Guidelines” (Macdonald, 2003).

The report concludes that existing ergonomics standards and guidance related to work-related MSDs prevention have some deficiencies, when evaluated in relation to contemporary ergonomics knowledge. These include:

- a narrow focus on a subset of physical hazards (particularly the severity of biomechanical hazards), with inadequate assessment of the effects of temporal exposure and total dose
- a narrow focus on physical hazards, with inadequate coverage of a wide range of other factors that have been clearly established as important in the development of cumulative work-related MSDs, including psychological stress and its work-related precursors
- inadequate coverage of issues related to effective program implementation
- inadequate attention given by document designers to document usability.

These conclusions are consistent with the reviews of other researchers. For example, Westgaard and Winkel’s critical review of the guidelines for occupational musculoskeletal load as a basis for intervention concluded that present guidelines were mainly based on laboratory studies aiming to eliminate short term physiological
or psychological responses. These guidelines were clearly inadequate and may be misleading in view of research regarding the relationship between physical work load exposure and the development of musculoskeletal complaints at the workplace (Westgaard and Winkel, 1996).

In a review published in 1996, Dul et al estimated that about 700 published or draft standards relating to ergonomics existed (Dul et al., 1996). The scarcity of epidemiological data and lack of sufficient knowledge of pathophysiology are serious problems in attempts to design quantitative regulations. Designing of regulations on ergonomics is fraught with problems such as insufficient knowledge about mechanism and exposure-dose-response relations, and lack of consensus on definition. The multifactorial character of the disorders, especially risks involving work organization, further increases the problem (Kilbom, 1999).

The poor results of voluntary prevention and the large costs of MSDs cry for good regulations and standards which are based on sound science and acceptable to the society. Against this backdrop, the following recommendations were made by the IEA experts group concerning ILO policy decisions and the proposed 'issues' paper to be prepared prior to developing the ILO guidance document:

- Possible purpose(s) and user group(s) of the proposed ILO document need to be reviewed and clarified.
- Following such clarifications, the document's breadth of coverage needs to be reviewed and determined.
- The document content and presentation style required to maximize the likely effectiveness of program implementation should be reviewed and determined.
- The issue of whether or not quantitative risk assessment criteria should be specified in such a document should be reviewed in light of the document's intended purpose(s) and users.
- Practicable methods for managing and controlling temporal exposure and overall hazard dose need to be developed.

This report constitutes a first stage of the ILO/IEA collaborating process that is intended to culminate in a draft ILO guidance document for the prevention of work-related MSDs. Based on the conclusions and recommendations of this report, the ILO and IEA are currently working on a concrete and detailed collaborating plan to decide the nature, type and contents of the proposed international instrument on ergonomics at the workplace and to prepare a technical basis for the development of this international ergonomic guidance document. It is planned by the Secretariat of the ILO to make a proposal to the ILO Governing Body in the course 2010 and 2011 biennium to formally start the development process of this international labour instrument on ergonomics at workplace.

4. Conclusions and discussions

Changes in the working environment in recent decades have both created new ergonomic related health problem and exacerbated existing ones in among the different working populations. Ergonomics has been an important part in the ILO’s occupational safety and health activities. The tripartite constituents — governments, workers and employers — requested the ILO to give high priority in developing new instruments on ergonomics which should be based on good and sound state of the art scientific development on ergonomics. To meet this challenge, activities in the following areas need to be considered:

(1) The surveillance of ergonomics hazards needs to be established in response to rapid and complex changes in the world of work. Surveillance should cover all the aspects of ergonomics at the workplace which could include: injuries and diseases caused by adverse ergonomic conditions and factors, economics losses, preventive and protective provisions and their applications. Workers' compensation data may be insufficient for estimating the magnitude of the work-related MSDs. Many injured workers with MSDs, perhaps even the majority choose not to request for compensation, seeking treatment on their injuries on private basis. The frequency of work-related MSDs is often severely underestimated, in some cases could be by as much as 60%, when relying only traditional administrative data sources (Fine et al., 1986; Silverstein et al., 1997). To overcome these problems, various data sources and methods should be used (registers, surveys, labour inspection reports, etc).

(2) Studies and investigations need to be conducted on the occurrence of ergonomic risk factors and work organizations. Assessments need to be conducted on the risk factors of interest, feature of the measurement device, feasibility considerations, and variations at the workplace. The selection of variables should permit specific etiological inference. The parameterization of an exposure variable should address the three principle exposure dimensions — intensity, frequency and duration (Burdorf and van der Beek, 1999). Information on the numbers of persons exposed to adverse ergonomic working conditions, levels of exposure and impacts of protective and preventive ergonomic measures need to be collected.

(3) It is an increasing important challenge to address risk assessment in occupational situations in which the physical work load and MSDs develop through an interaction between the workplace, leisure time activities, and individual factors. This challenge is clearly of both a scientific and a policy nature (Westgaard, 1999). Valid and feasible indicators need to be developed and standardized so that not only comparison could be done in different localities or among different countries, but also information could be used for protective and preventive measures.

(4) Ergonomics is often viewed in a simplified way as it focuses mainly on the physical aspects of work: force, repetition rate and posture (Brian Pearce, 2003). Psychosocial factors are often misunderstood and ignored. Perceived changes in leadership, social climate, organizational commitment, and job strain have significant effects on changes in workers health. Addressing these factors at workplace will improve workers' health and affect organizational outcomes in the long run (Lohela et al., 2009). Workers highly exposed to both physical and psychosocial risk factors at the workplace are more likely to report symptoms of MSDs than workers highly exposed to one or the other. Human responses to stress can present risk factors that may cause injury. Ergonomics programmes need to be focused on both physical and psychological risk factors and on the root cause of the problem such as the design of the job.

(5) Few studies have examined differences in MSDs injury rates for men and women and for unionized and non-unionized workers. There have been reports that non-union and women workers have higher rates of MSDs. Explanations for these phenomenon could include differences in training in safer work practices and in working experiences, different job assignments, age, sex in relation to physical size and strength, health care seeking behaviour, etc (Lipscomb et al., 1997). Further investigations and studies in these areas are warranted.

(6) Guidelines are needed on the major work-related risk factors that should be eliminated or minimized such as manual handling of materials, repetitive work, static work, segmental vibration, and poor psychosocial work environments. Studies and evaluations on the technological and economic feasibilities of the application of these guidelines need to be conducted.


