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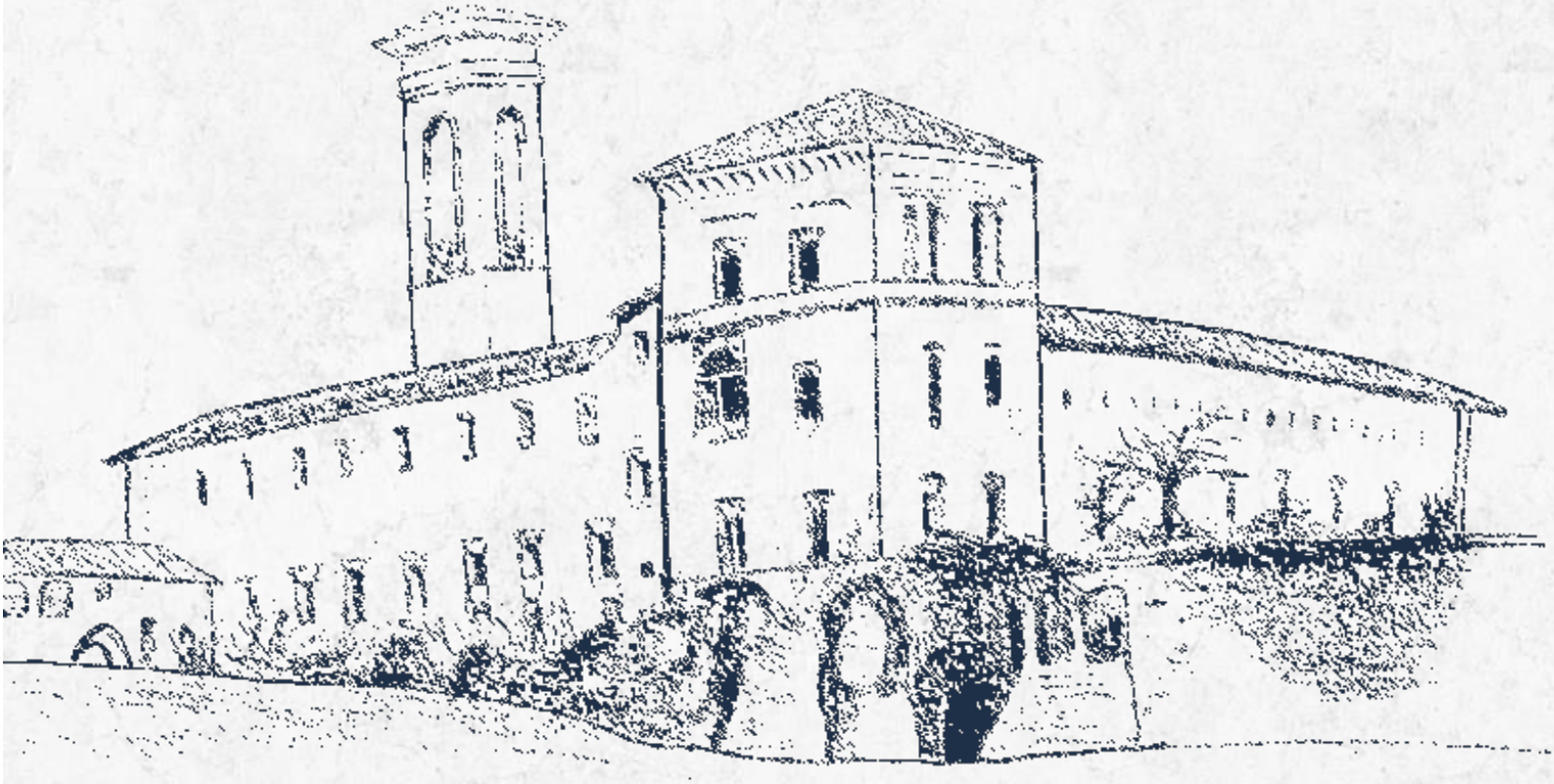

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Musculoskeletal Disorders: Cross-cutting and Critical Issues concerning the Causal Link. A Theoretical and Experimental Investigation in the Retail and Distribution Sector

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1. Introductory Remarks

This is a paper that was presented at the 3rd International Conference on Precarious Work and Vulnerable Workers held in Toulouse Business School in 2013. One of the streams for the conference was concerned with health and safety issues, which included this paper which represents work in progress on an interesting piece of research on musculoskeletal disorders and supermarket cashiers. It is a comparative analysis of the legal, organisational and ergonomic issues concerning those musculoskeletal disorders and pathologies associated with biomechanical overload amongst the active population. The authors conducted a theoretical and wide-ranging investigation in order to assess the correlation between musculoskeletal disorders and the working activity performed by cashiers within the retail and distribution industry in Italy.
It is worth noting that the 4th International Conference on Precarious Work and Vulnerable Workers will take place in Mexico in early Autumn 2014. Further information available on the ADAPT website http://moodle.adaptland.it/course/view.php?id=22.

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2. Musculoskeletal Disorders: A Comparative Analysis of National Legislation and Relevant Provisions

Musculoskeletal disorders and the pathologies caused by biomechanical overload are occupational diseases which affect the vertebral column, the tendons, the nerves and the muscular as well as the circulatory system. They can be ascribed to incorrect and compulsory postures, prolonged exposure to repeated micro-traumas and functional stress, or to overloads which might occur while working[1]. Generally speaking, three types of pathologies can be identified: the pathologies of the vertebral column (acute lumbalgia, disk herniation, spondylolysis), those caused by repetitive movements of the upper limbs (carpal tunnel, jerky finger, syndrome of De Quervain.), and those associated with repetitive movements of the lower limbs (Achilles, tendinitis, lesions of the meniscus, plantar talalgia).

In looking at the definitions provided by the relevant literature at national and international level, one might note that the type and the manifestation of these disorders are ill-defined, an aspect which affects their prevention and the identification of the causal link. In any event, the interest of the academic community towards this topic is a further confirmation of its significance in the work environment.

Indeed, the foregoing ailments are to be found particularly amongst those workers employed in manual labour, e.g. agriculture, fishing, mining, logistics, construction, retail and niation, spondylolysis), those caused by repetitive movements of the upper limbs (carpal tunnel, jerky finger, syndrome of De Quervain.), and those associated with repetitive movements of the lower limbs (Achilles, tendinitis, lesions of the meniscus, plantar talalgia).

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[1] European Agency For Safety And Health At Work, *Work-related neck and upper limb musculoskeletal disorders,* Bilbao, 1999.

logistics, construction, retail and wholesale trade within mass distribution, as well as the hotel industry and the health and catering sectors.

In addition, one might note the importance of the risk factors associated with some younger workers, who are sometimes engaged in precarious employment. Statistically, they are regarded as the most vulnerable category of workers, since they are sometimes employed to perform unsafe tasks. Of relevance is also the high incidence of these illnesses among women, especially with reference to carpal tunnel syndrome, as some authoritative authors have underlined.

Unlike those occupational illnesses for which a direct cause and effect relationship is acknowledged between harmful agents and the illness itself, both the pathologies and musculoskeletal disorders caused by biomechanical overload are defined by the World Health Organization as "*aetiopathogenesis* multi-factorial illnesses", since they have been reported also within the population that is not exposed to such harmful agents. In addition, according to the medical literature, they are caused by non-work factors, among which are ageing, prior traumas, chronic pathologies (diabetes, arthritis, menopause) and incorrect and repeated movements performed in sports and/or hobbies[2].

It appears clear that disorders of this kind may have a variety of causes, not strictly related to working activity. For this reason, when considering musculoskeletal disorders and pathologies resulting from biomechanical overload, such as job-related illnesses, the European Agency for Safety and Health at Work (EU-OSHA) has classified specific job-related risks into two categories. Here, the physical risks linked to the way the job is performed (lifting loads, incorrect ergonomic positions, repetitive movements, vibrations and so forth) are distinguished from environmental and organisational factors (job cycles and schedule, remuneration, and microclimate) as contributing causes.

3. Statistical Data and the Economic Scenario: A Comparative Analysis

If statistics are taken into account, the pathologies of the vertebral column and the upper and lower limbs more generally are the most widespread

[2] A. Luttmann, M. Jäger, B. Griefahn, *Preventing Musculoskeletal Disorders in the Workplace*, Protecting Workers' Health Series No. 5, cf. http://www.who.int/occupational_health/publications/muscdisorders/en/.

causes of disability and the most frequent underlying reason for sickness absence in industrialized countries. In contrast to Europe, this topic has long been investigated in the United States, and musculoskeletal pathologies account for more than 65% of all occupational illnesses reported in the US work environments.
According to the National Institute of Occupational Safety and Health (NIOSH USA) these pathologies rank in first place among the ten most common health disorders in the US manufacturing system, since they account for almost 29 days of sickness absence for every 100 days with those below 45 years being the most affected. They are usually males if they are engaged in the manual handling of heavy loads, and usually females in the case of biomechanical overload. Both groups are primarily affected by occupational pathologies of the vertebral column[3]. In economic terms, in the USA, these pathologies account for 33% of the total costs of compensation in the event of occupational illnesses, amounting to some 15-20 million dollars and a total cost of over 60 million dollars, if the direct health costs as well as indirect costs associated with absence from work are considered.

As for Europe, these pathologies have only recently been examined; statistics here are difficult to interpret and to compare because of the differences in national legislation, certification and compensation schemes provided for occupational illnesses. Nevertheless, a number of surveys on the working conditions in Europe conducted by the Dublin European Foundation for the Improvement of Living and Working Conditions (Eurofound) and the Bilbao European Agency for Safety and Health at Work (EU-OSHA), make it possible for the evolution of this phenomenon to be traced.

The data collected in a 1996 survey already pointed out that the most widespread health disorders reported by EC workers included back pain (30%), and muscular pain of the upper and lower limbs (17%).

In 2004, a review of the surveys on health conditions pointed to a significant increase in these pathologies reported by almost two-thirds of workers who were exposed to repetitive movements which caused musculoskeletal pathologies. This tendency is also confirmed by most the recent data, published in 2007, according to which these pathologies account for more than 45% of all occupational illnesses, and include back pain (25%), muscular pain (23%), and stress disorder due to repetitive

[3] National Institute of Occupational Safety and Health, *Musculoskeletal Disorders and Workplace Factors: A Critical Review of Epidemiologic Evidence for Work Related Musculoskeletal Disorders of the Neck, Upper Extremity, and Low back*, 1997, n. 97, 141.

movements (22%), with percentages that reach 39% if those countries which recently entered the EU-27 are considered separately.

The social relevance of these pathologies is easily understood taking into account the statistics that compare all the occupational illnesses reported in Europe. Tellingly, over 70% of the illnesses reported are caused by physical agents (pathologies due to musculoskeletal disorders and biomechanical overload). By way of example, carpal tunnel syndrome, hand and wrist epicondylitis and tendinopathies are found in more than 50% of all the claims; followed by respiratory distress, skin infection, infectious illnesses, and illnesses caused by chemical agents. From a socio-economic point of view, although exact figures are not available at the Community level, the cost of all job-related illnesses range between 2.6% and 3.8% of GDP, with those linked to musculoskeletal disorders ranging between 0.5% and 2% of GDP[4]. This is due to the loss of over 600 million[5] working days every year, which in turn determines an increase in the cost of insurance. It also leads to a reduction in production, certain psychological impacts on the quality of work and loss of experience of personnel, to which further costs for the hiring and training of new workers are to be added, if those affected by these illnesses cannot return to work.

4. Community Framework

The EC laid down some guidelines through Framework Directive 89/391/EC and more detailed directives issued afterwards. The first one sets out the general objectives on health and safety at work, whereas the other directives are concerned with some specific aspects. Particularly relevant in this connection are Directive 89/654/EC concerning the minimum safety and health requirements for the workplace, Directive 89/655/EC concerning minimum safety and health requirements for the use of work equipment by workers at work, Directive 89/656/EC concerning minimum safety and health requirements for the use of individual protective equipment, Directive 90/269/EC on minimum health and safety requirements for the manual handling of loads, and

[4] European Foundation For The Improvement Of Living And Working Conditions, *Fourth European Survey on Working Conditions,* Dublin, 2005.

[5] European Agency for Safety and Health at Work, *Work-related Neck and Upper Limb Musculoskeletal Disorders*, Bilbao 1999.

Directive 90/270/EC concerning the improvement of safety and health of workers at their working place performing activities on display screen equipment. The last two directives are clearly the most important ones in terms of prevention of the disorders and pathologies surveyed here. More precisely, Directive 90/269/EC has unified existing legislation, simplifying and supplementing the provisions in force on consequential lesions from the manual handling of loads. As a result of this directive, most Member States have applied its principles to all industry sectors, with the obligation to determine and evaluate the risks associated to the manual handling of loads which has been recognised as an innovative feature. As for Directive 90/270/EC, it supplies an important contribution to the ergonomic aspects and risk prevention for employees working with display screens. Among the innovations introduced by national legislation and in line with the directive, special mention should be made of the right to periodic interruption of the daily routine with breaks or changes of activity for workers using display screens, the right to eye examinations, and where necessary, the supply of corrective devices.

With the intention of adopting a global and specific approach on the issue of musculoskeletal disorders, in 2004 the EC started a first round of consultation with the social partners on a proposal for a directive. It pointed out that these pathologies resulted from inadequate ergonomics for both men and women who assume incorrect postures; perform monotonous and repeated assignments; use inadequate working and organisational methods and – more often than commonly held – who lift heavy loads.

A second round of consultation took place in 2007, when the social actors, while recognising the key role of existing legislation, highlighted the difficulty in dealing with musculoskeletal disorders and their causes as a result of the multiple nature of such problems in terms of prevention and risk management. Following these consultations, in 2009, a new directive on all the major risk factors associated with job-related musculoskeletal problems was proposed, which would also replace the two directives currently implemented. Major progress was expected in 2011, but progress is limited.

5. National Case Studies

Following a comparative study on the provisions concerning the prevention of musculoskeletal disorders, it has been assessed that among all the countries surveyed – Spain, France, the United Kingdom, the

United States, Finland, Sweden, Denmark, Canada, Norway, Germany, Switzerland – for which substantial evidence of these disorders has been found, several differences in both legal and definitional terms exist along with other peculiarities for some aspects related to the acknowledgement of the pathologies. This aspect proves the non-existence of a global approach to the problem, all the more so in countries like Spain, Finland and Sweden where a proper definition was difficult to find. On the other hand, in different times and through different methodologies, every single country has adopted specific national legislation concerning risk prevention and, in some cases, also for compensation. Below are some examples.

5.1. United Kingdom

In Great Britain, the main piece of legislation on health and safety at work is the Health and Safety at Work Act of 1974[6]. As a result of this Act and subsequent amendments, the implementation and monitoring of the law falls within the responsibility of the Health and Safety Executive (HSE), and it is up to local inspectors to assess its implementation. Two provisions exist on musculoskeletal disorders: the Manual Handling Operations Regulations and the Health and Safety (Display Screen Equipment) – both issued in 1992. Both regulations are intended to implement Framework Directive 89/391EC.
In the British system, these provisions are accompanied by some guidelines compiled by the HSE, to be considered as an effective and practical support with no legal standing, particularly during judicial proceedings. Substantial differences with other Member States are to be found in matter of compensation for accidents at work and occupational illnesses. Workers – besides the possibility of directly applying to social security for compensation – may legally pursue the right to be compensated by the employer who is found culpable of negligence or other violations that may have contributed to cause the accident. The

[6] The United Kingdom is an EU member state consisting of three jurisdictions, where part of national legislation does not apply to all jurisdictions. Legislation on Health and Safety at Work generally applies in Great Britain (particularly England and Scotland), while Northern Ireland has specific legislation on this subject. Legislation is becoming more and more regional, particularly as a consequence of the establishment of regional Parliaments in Scotland and Wales. By way of example, in 2009 Scotland approved national legislation on pathologies linked to Asbestosis. However, at present no regional legislation has been issued on upper limbs disorders.

rules determining the right to compensation draw almost entirely on legal precedents and were issued prior to extant legislation on risk prevention and professional illnesses.

5.2. Canada

As a result of Canadian legislation (Occupational Health and Safety Act - OHSA), employers have an obligation to take the necessary steps to protect workers from anything that may cause musculoskeletal injuries. Here, unlike other countries, the definition of the general obligations is assigned to government inspectors and experts on ergonomics, as provided for in the OHSA concerning ergonomics and preventive measures. The Committee on Ergonomics is made up of experts in the field who constitute a special advisory body which examines and defines strategies to tackle job-related musculoskeletal disorders, and develops strategies for the effective re-insertion of those workers who have been affected by these pathologies. To achieve these objectives, the Commission collaborates with the Safety Council of Ontario (OHSCO), consisting of representatives from the Ministry of Labour, the Workplace Safety and Insurance Board (WSIB) and the Health and Safety associations (about twenty sectoral associations for Health and Safety and the Occupational Health Clinics for Ontario Workers). The Commission also works with the Institute for Work and Health-IWH and the Centre of Research Expertise in the Prevention of Musculoskeletal Disorders-CRE-MSD to develop a coordinated strategy.

5.3. Denmark

Danish legislation has adopted an active approach toward the enactment of Directive 90/269/EC on the manual handling of loads and Directive 90/270/EC on the use of display screen equipment. Denmark legislated on this issue starting from 1992, with the last provision on this subject being passed in 2002. The growing interest towards the prevention of musculoskeletal disorders is highlighted by some recent statistics, according to which only 15% of workers seem to be affected by job-related muscular pain to neck, shoulders and upper limbs, a percentage which is lower than the European mean[7]. Furthermore, in considering the

[7] S. Bevan, R. McGee, T. Quadrello *Fit For Work? Musculoskeletal Disorders and the Danish Labour Market* The Work Foundation

period 2003 to 2009, statistics pointed out that men and women are affected by different job-related disorders, and these figures are strictly linked to their occupation, as men are chiefly employed in the building sector, while women usually operate in the retail sector. Further, the National Board Report stated that compensation rates from 2005 to 2009 are 4-5 points higher for men, thus the retail sector is less affected by these job-related disorders.

5.4. Finland

Despite the implementation of the two main European directives (90/269EC and 90/270/EC), Finland has not yet devised any official definitions[8] for job-related musculoskeletal disorders. These pathologies are referred to in legislation on job-related disorders, which, however, has not been updated since 1989. This may explain the increase of the phenomenon in this country, which appears to be the main cause for temporary incapacity to work and – together with mental disorders – it also explains the rise in the benefits allocated for permanent disability. Compared to previous statistics, some recent estimates point out that direct and indirect costs have reached 0.8% of the country GDP.

5.5. France

In France, musculoskeletal disorders represent the most common occupational illnesses and they constitute a substantial cost for society. First, the French system seeks to offset and upper limbs, a percentage which is lower than the European mean[9]. Furthermore, in considering the period 2003 to 2009, statistics pointed out that men and women are affected by different job-related disorders, and these figures are strictly linked to their occupation, as men are chiefly employed in the building sector, while women usually operate in the retail sector. Further, the

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http://www.fitforworkeurope.eu/Downloads/Website-Documents/ffw_Denmak311009.pdf.

[8] European Working Condition Observatory, Managing Musculoskeletal Disorder – Finland, Anna-Maija Lehto, ed., Statistics Finland, 2007.

[9] S. Bevan, R. McGee, T. Quadrello, *Fit For Work? Musculoskeletal Disorders and the Danish Labour Market* The Work Foundation http://www.fitforworkeurope.eu/Downloads/Website-Documents/ffw_Denmak311009.pdf.

National Board Report stated that compensation rates from 2005 to 2009 are 4-5 points higher for men, thus the retail sector is less affected by these job-related disorders.

5.6. Germany

German legislation on health and safety at work draws to a large extent on the European and international legal standards, making reference to the ILO conventions and to European Council Directive 89/391/EC of 12 June 1989 (Framework Directive). Other important provisions on this subject have given force of law to the subsequent Community directives. In Germany, various government agencies are responsible for health and safety at work, in particular: the BAuA (Federal Institute for Occupational Safety and Health) on health and safety, and the LASI (government committee for health and safety at work), that introduces guidelines to evaluate health and safety performance in manual handling of loads. Over the last years, a great deal of attention has been directed to the prevention of musculoskeletal disorders, also showing the benefits of corrective actions, and indicating procedures for the reinsertion of those workers who have been affected by these diseases.

5.7. Norway

Like Finland, Norway does not provide an official definition of job-related musculoskeletal disorders. According to the most recent statistics, these disorders are the cause for one third of all job absences, and they are regarded as the most prevalent occupational illness among workers. In order to change this state of affairs, a new provision was introduced in 2005 concerning the working environment, laying down an obligation to adopt suitable and correct measures to prevent risks for health and safety at work. Apart from these legal measures, other actions have been taken to set up a national network, created by the government with the purpose of increasing flexibility at work and guaranteeing a more inclusive working life to those workers affected by these disorders.

5.8. Spain

Spain is another country where it is not possible to find an official definition of musculoskeletal disorders, although these occupational pathologies are particularly widespread among workers. Some of these disorders – above all those linked to mechanical vibrations – are classified

as occupational illnesses by Royal Decree No. 1995/1978 of May 12 and the Spanish Social Security Institute (*Seguridad Social*).
In the current legal system, the task to provide adequate working conditions is assigned to the National Institute of Safety and Health at Work (INSHT), which operates through preventive measures in order to reduce the occupational risks. There are no official statistics concerning the economic impact of such diseases. However, absence from work due to occupational illnesses represents a fundamental matter for all actors involved, that is workers, employers, the government and the insurance companies.

5.9. Sweden

Sweden, which has promptly implemented the Community directives, also falls within those countries which have been unsuccessful in tackling the issues arising from musculoskeletal disorders. In considering the statistics from 1996 to 2005 one might note that the incidence of these issues reported a significant increase. More specifically, it has been demonstrated that ergonomic factors represent the most common cause of musculoskeletal disorders for both men and women (in 58% of the cases). In addition, musculoskeletal disorders caused by incorrect postures at work have reached 12% in 2003 among women only, even if a significant improvement was reported lately in this connection. As for men, an increase was registered from 1996 to 2003, with a 9.2% peak which was followed by a progressive reduction[10].

5.10. Switzerland

Here, two main provisions have been laid down which regulate health and safety at work, that is Labour Law and Accident Insurance Law for Accidents at Work. The former covers working hours, health protection, ergonomic standards and personal integrity, whereas the latter is concerned with the prevention of occupational accidents and diseases. The cantonal labour inspectorates, SUVA – which is the main accident insurance authority – and the State Secretariat of Economic Affairs (SECO) are in charge of enforcing these provisions. A "coordination"

[10] Arbetsskador Preliminära uppgifter, *Occupational Accidents and Work-related Disorders 2004*, Swedish Work Environment Authority, 2004.

commission (EKAS) oversees and funds the inspection system for accident prevention. About one million people in Switzerland are affected by pathologies causing some sort of disability to work. Among these pathologies, musculoskeletal disorders have been identified as the main cause for health issues at work resulting in high levels of absenteeism. To tackle this problem, in 2003 the Federal Council started a national research program consisting of 53 projects of a duration of 5 years. The objective is to contribute to research on musculoskeletal issues, introducing strategies which operate multi-disciplinarily and improving health care through the development of new therapies.

5.11. USA

On the basis of statistics in 2010 on the number of non-fatal accidents at work and published by the US institutions in 2011, the incidence rate of musculoskeletal disorders increased from 4 to 34 episodes per 10,000 full-time workers.
This data is to be considered along with the peculiar methodology adopted in the US statistic surveys, according to which employers are asked to register and report – except for situations with more than ten employees or for some high-risk sectors – the cases of fatal accidents, illnesses and work-related accidents. The correlation between work experience and the accident or pathology occurred at work must be presumed for those accidents and pathologies resulting from factors linked to the working environment. Therefore, a list of disorders that can take place at work but are not considered job-related is made available. An exception is made for mental disorders and for accidents caused by actions and situations linked to workers' private life. Within this system, the National Institute for Occupational Safety and Health-NIOSH is in charge of carrying out research on health and safety at work, providing information, education and training to promote safe and healthy workplaces for all workers.

6. Italian Legislation and Legal Protection

In Italy, only a few provisions have been laid down to prevent the onset of diseases associated with repeated movements and heavy lifting, all the more so in the retail sector.
Indeed, the evolution of Italian legislation on health and safety issues was anything but smooth, particularly at the time of implementing the EC

guidelines. In this connection, three phases can be identified which correspond to three different regulatory approaches. The first phase refers to the period prior to the enactment of Legislative Decree No. 626/1994, when the focus was on the protection of the most vulnerable categories, that is females and working mothers. The decree attempted to place limitations on certain tasks, such as lifting loads and performing demanding work. The other phase coincides with the enforcement of the foregoing decree, where a whole section was devoted to the regulation of the manual handling of loads. For the first time ever in national legislation, this provision applied to all workers involved in such an activity and was intended to prevent the risks associated with musculoskeletal disorders.

Finally, the last phase is to be identified with the passing of Legislative Decree No. 81/2008, best known as Consolidated Act on Health and Safety at Work, which makes provisions for a sound organization of the workers' safeguards in terms of health and safety. Aside from the definitions of "manual handling of loads" and "biomechanical overload", the Legislator has envisaged the possibility for the employer to adopt specific provisions, good practices or guidelines in order to fulfill his/her obligations.

Another fundamental aspect is the provision of health insurance in case of occupational illnesses. This topic has long been dealt with through a scheme which supplied protection taking into account the legal presumption only for those occupational illnesses included in certain special list. In 1988, thanks to ruling no. 179 of the Constitutional Court, those occupational illnesses which were not included in those lists have also been considered for protection purposes, therefore introducing the so called "mixed system". Basically, all job-related illnesses are covered by health insurance, with the only difference that for those not officially listed, it is up to the worker to prove that the illness was job-related. As for skeletal muscle pathologies, the turning point was the redefinition of the foregoing lists by means of Ministerial Decree of 9 April 2008. In this sense, besides "illnesses caused by mechanical vibrations transmitted to arms and hands" which were already envisaged, "lumbar herniated disc" and "illnesses caused by biomechanical overload of the upper arms" were added. Also, other illnesses have been introduced – yet for the manufacturing sector only – that is those caused by "biomechanical overload of the knees".

7. Technical Provisions on Risks Assessment

The evaluation of those risks linked to the manual handling of loads must necessarily be preceded by a job analysis, to take place in the context of a more general assessment. Manual handling consists of all those operations related to the transport or handling of loads by one or more workers, including lifting, pushing, throwing, bringing or moving a load. It is necessary to identify the most sensitive tasks and to operate an evaluation in compliance with Italian legislation, that defers to ISO technical procedures of series 11228 (parts 1-2 -3) and to the UNI EN 1005-2 for voluntary adoption of health management, yet not of an exclusive character, opening to the possibility of further validation strategies on this topic. In this connection, other ways exist through which employers can carry out the risk assessments.

Among the different criteria used to evaluate the manual handling of loads[11], the NIOSH is surely the most used since it applies to all industrial sectors. It permits determination of the maximum load at the time to lift, taking into consideration important elements such as age and gender. Besides the NIOSH, another method often adopted in terms of risk assessment is the SNOOK & CIRIELLO, which considers the risks associated with pushing and hauling. Both methodologies require, however, high levels of expertise and this complicates their immediate implementation.

Further methodologies include the OWAS, which examines the postures assumed by a worker, yet without determining the maximum limit of load weight, and the TLV ACGIH which, however, doesn't consider all the risk factors. Less widespread are the MCG SUVA which is penalized by its analytical nature, and the MAPO that is applicable to the health sector at the time of handling patients. There are other criteria to evaluate risks arising from biomechanical overload[12] which are linked to a special job procedure (job cycles with movements and/or repeated strain). The most relevant is the OCRA and the relative Check-List, that provides an index that can be easily read and interpreted. The same cannot be said of the

[11] For a detailed analysis of the evaluation methods adopted for the manual handling of loads, see P. Cinquina, *Movimentazione Manuale dei Carichi: metodi di valutazione, Ipsoa, Milano, 2009*

[12] P. Apostoli, E. Sala, A. Gullino, C. Romano, *Analisi comparata dell'applicazione di quattro metodi per la valutazione del rischio biomeccanico per l'arto superiore*, Giornale Italiano di Medicina del Lavoro e dell'Ergonomia, 2004, vol. 26, 223-241.

ACGIH, which is far more complicated despite its widespread implementation.
Mention should be made of the OSHA Check-List, which represents an easy and quick screening tool to assess the risk either for single or multiple assignments. Less relevant are the OREGE French, the RULA and the Job Strain Index, due to the difficulty in applying them to the manufacturing sector and also to the fact that they do not cover all the risk factors. To sum up, there is no methodology to concurrently assess the risks associated with the manual handling of loads and biomechanical overload. In addition, the technical provisions illustrated here present specific limits due to the difficulty of application to all productive sectors. Furthermore, it is impossible to carry out a balanced evaluation of the risks if within the same productive sector different evaluation criteria are adopted which lead to a likely varied risk assessment.

8. Case Studies: Experimental Investigation on Cashiers in the Retailing and Distribution Sector

8.1. General Considerations

As already said, musculoskeletal pathologies include a wide variety of inflammatory and degenerative conditions affecting muscles, tendons, ligaments, articulations, peripheral nerves and vascular structures. Although not necessarily related to the working activity, they constitute the largest category among those contemplated by the Occupational Medicine in Developed Countries. Consequently, musculoskeletal disorders (MSDs), in particular those affecting the upper limbs, have been investigated extensively recently. Different interpretations have been given on the possible developments of the musculoskeletal pathologies of the upper limbs among manual workers employed as cashiers in supermarkets in comparison to the normal population.

8.2. Purpose of the Study

The study was conducted in 2012 by the Orthopedic Clinic of the University of Milan, at the Orthopedic Institute Galeazzi IRCCS, with the purpose of assessing the existence of osteoarticular lesions of the upper limbs in a group of workers employed as cashiers in the retailing industry, an occupation considered at risk of musculoskeletal pathologies of the

upper limbs. The other goal was to gather as many clinical data as possible, in order to set the basis for a prospective observational study on the evolution of the pathologies, if any. In sum, the purpose of the investigation has been to verify the existence of the most frequent musculoskeletal pathologies of the upper limb in a group of workers employed as cashiers in comparison to samples of non-working population. Methodologically, an observational, transversal model has been employed, based on the observation of a phenomenon or a clinical event in a determined time-period.

8.3. Methodology

The sample has been evaluated between November 2011 and April 2012. 504 evaluations have been carried out, 199 on cashiers (group of study) and 305 on individuals chosen among the general population (group of control). The cashiers (all women) have been recruited among five stores of the retail industry in Lombardy, and concerned all the cashiers of the stores. All those involved had provided their written consent to take part to the survey. The control group and the study group feature the same characteristics in terms of age and gender. Particularly, the selection process has been carried out among the cashiers' family relatives who belong to the group of study. As for the selection criteria:

- The individuals were between 18 and 65 years of age;
- The individuals were not / have never been a cashier;
- The individuals do not perform / have never performed any working activity involving repeated movements of the upper limbs and the manual handling of heavy loads;
- There was an absence of potential modifiers of effect for musculoskeletal disorders of the upper limbs (inflammatory, rheumatic, oncologic, or post-traumatic pathologies, or upper limb surgeries).

Each individual has been evaluated considering three steps:
a) An anamnestic questionnaire;
b) Orthopedic evaluation;
c) Instrumental evaluation.

9. Preliminary Conclusions

One of the main purposes of this study has been to establish if, in case of an anamnestic report - for instance concerning pain, numbness, functional limitations – over a sample of manual workers, there were well-defined organic lesions of the upper limb from the anatomo-pathological point of view, as it was evident from the diagnostic and instrumental tools currently available. Another purpose was to establish the prevalence of these pathologies among a wide population of workers and the non-working population.
Although the results provided data which are meaningful only to some extent, as well as some interesting insights, there are still a significant number of variables which need to be investigated. For instance, data processing and analysis are still ongoing and involve the effective exposure of the cashiers, the annual working activity, the relationships between the symptoms and the perceived stress, the smoking habit, the use of contraceptives and so forth. Therefore, the preliminary nature of the analysis of the significant amount of data collected does not allow to draw definitive conclusions. Nevertheless, it is already possible to identify some interesting aspects which are reported below.

9.1. Shoulder

- There is a high prevalence of shoulder symptoms within the cashiers, while the clinical and functional statistics does not show meaningful differences among the two groups.
- The prevalence of ultrasound alterations is the same in both groups.
- The age distribution of the ultrasound alterations is similar in both groups.
- The higher prevalence of pain reported by the cashiers does not correspond to an increase of objectively detected organic lesions in comparison to the group of control.
- In the light of the results of this preliminary analysis, it seems legitimate to assume that the cashiers' activity does not overload the shoulder more than what happens among the general population.

9.2. Elbow

- There are no meaningful differences in the prevalence of subjective symptoms.

- From a clinical point of view, there are no meaningful differences in the request for an in-depth examination of doubts concerning the diagnosis among the individuals surveyed.
- It appears legitimate to assume that the cashiers' activity does not overload the elbow more than what happens among the general population.

9.3. Wrist / Hand

- The prevalence of wrist /hand subjective symptoms is higher in the cashier group, above all with regard to the non-dominant limb.
- The objective clinical examination has led to a larger – yet irrelevant – number of requests of diagnostic and instrumental examination in the cashier group.
- The specific clinical tests resulted positive in a limited number of individuals, the majority of whom belonging to the cashier group.

Although fully aware of the small sample taken into consideration for this study, gathering different data does not seem to allow to effectively assess the possible presence of job-related pathologies in the cashier group. Therefore, an analysis on a larger sample of individuals is necessary, to be conducted also with electro-diagnostic examinations. Further, in consideration of the often spontaneously remittent nature of the most widespread pathology found in this district (tunnel syndrome), an observational study is also advisable.

10. Conclusions

The survey pointed out that despite the well-established views on this subject, the absence of consolidated and systematic legislation, as well as the inaccurate and the contradictory nature of the operational tools for survey and management at the workplaces – certain objective conditions for musculoskeletal pathologies seem to arise from the manual handling of loads and biomechanical overload. Another aspect that has been considered is related to the difficulty of risk assessment, referable to the actual carrying out of the duty, and confirmed by the proliferation of different criterions used in terms of risk evaluation, as well as the recognition of aetiopatogenesis, as pointed out by the relevant literature. It must be added that the numerous provisions issued at different levels to increase protection and prevention are far from being effective evaluation and management tools and are in need of improvement. This is so due to

the discrepancies in the implementation and interpretation criteria adopted by the operators and monitoring authorities.

The survey paints a worrisome phenomenological and statistic picture, also showing the uncontrolled tendency to encompass within the labour domain – health, legislation, allocation of benefits – pathologies for which unambiguous data are provided with reference to survey methodology and to the real causes of the onset of these illnesses. This obviously translates into unsteady etiological foundations, and into incomplete law-making processes.

In practical terms, some critical issues emerged when it comes to phenomenological aspects and the etiological determinations from medical literature, as well as to more tangible protection in search of a causal link to the working activity, as confirmed by the results of the case study discussed here. The survey considered the existence of pathologies comparing those workers particularly exposed – the cashiers employed in the retail and distribution sector – and the less exposed individuals referred to as general population. From a preliminary investigation, no clear evidence links the pathologies under analysis to the cashiers – if different body parts are considered – a category of workers identified as highly exposed to such risks within the employer's premises.

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