Prevention of WMSDS from Biomechanical Overload in Agriculture: A Project by Italian Regions

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ABSTRACT

The biomechanical overload disorders of the musculoskeletal system are constantly increasing in Italy and became the most reported occupational diseases to INAIL (Italian Workers' Compensation Authority). Some sectors, such as agriculture, health and crafts, generally show a particular rise of these diseases while other sectors (such as fishing) are still struggling to bring out the work-related diseases. The Apulia Region included in the Regional Plan for Prevention 2010 - 2012 initiatives in order to secure a better understanding of the tools both for the assessment of risk due to the biomechanical overload of the musculoskeletal system and for the prevention of the diseases related to them. This approach allowed us to collect items of interest in order to better know the ergonomic risk in Apulian agriculture and to define the future prevention policies.

Keywords: Occupational diseases, Apulian agriculture, Regional Plan for Prevention, Biomechanical agricultural overload

INTRODUCTION

The biomechanical overload disorders of the musculoskeletal system are constantly increasing in Italy and became the most reported occupational diseases to INAIL (Italian Workers' Compensation Authority). The Tab. 1 summarizes the percentages of major diseases defined positively by INAIL in the period between 1994 and 2009, relating to their total (10,236 respectively in 1994 and 14,648 in 2009).

Table. 1 – Percentage of occupational diseases positively defined by INAIL – Source National Society of Prevention Operators (SNOP)

	1994	2009
Musculoskeletal diseases	2	61
Hearing loss	58,3	19
Neoplasms (asbestos, wood dust, leather dust)	0,4	3,2
Silicosis	5	0,6
Asbestosis	1,8	2
Skin diseases	6,5	0,8
Diseases caused by vibrating tools	2,9	0,6

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The Tables. 2 and 3, taken from MalProf data (national system for recording and analysis of reported occupational diseases reached the observation of Local Health Authorities, which allow the analysis of up to 2010), show the distribution of musculoskeletal diseases by economic activity (ATECO code 91) and by job. Clearly shows that most of these technopathies hit in descending order construction equipment (11% of MalProf reports), healthcare (6%), engineering and industries of food and drinks (each with 5%) and agriculture (3%). The analysis for tasks raises once again highlight the construction workers (14% of reports), workers specialized food processing, wood, textiles (12%) and metal workers (9%). Agriculture reaches only 3% of the reports. The limited number of occupational diseases in agriculture that reach the observation of Local Health Authority (much lower than you might expect, even in view of the significant increase in complaints registered on the contrary INAIL) could be explained by the prevalence of self-employed workers in this sector (farmers) and their lack of attention to the preventive aspects with limited guidance on risk assessment and health surveillance.

Table. 2 – Distribution of musculoskeletal diseases by ATECO class - Data MalProf 2000 - 2010

	Diseases of the rachis		*MSK diseases (excluding rachis and STC)*		*Carpal Tunnel Syndrome (STC)*		*Total*	
Economic Activity (ATECO91)	**Valore**	**%**	**Valore**	**%**	**Valore**	**%**	**Valore**	**%**
Undefined	2543	36	2016	26	1578	30	6137	31
Construction	1009	14	855	11	275	5	2139	11
Manufacture of fabricated metal products, except machinery and equipment	215	3	398	5	300	6	913	5
Manufacture of food products and beverages	156	2	453	6	345	7	954	5
Manufacture of machinery and equipment, including installation, assembly, repair and maintenance	69	1	263	3	207	4	539	3
Health and other social services	776	11	325	4	104	2	1205	6
Agriculture, hunting and related services	256	4	221	3	144	3	621	3
Manufacture of other non-metallic mineral processing	155	2	174	2	76	1	405	2
Manufacture of other transport equipment	44	1	109	1	68	1	221	1
Production of metals and their alloys	72	1	77	1	72	1	221	1
Other ATECO activities	1729	25	2740	36	2055	39	6524	33
Total	7024	100	7631	100	5224	100	19879	100

For this reason, going back to what emerged from INAIL Report on occupational diseases published in July 2010, the Parliamentary Commission of Inquiry of the Republic Senate about the phenomenon of industrial accidents with a special reference to the so-called "white deaths", in its Second Middle Report on the activity already carried out, during the meeting held on November 23rd 2010, verbatim states “Diseases of the musculoskeletal system (tendinitis, diseases of the intervertebral discs, carpal tunnel syndrome, etc.) exponentially grew due to biomechanical overload with nearly 18,000 reported cases - +36 per cent compared to 2008 and twice as many compared to 2005 when they were little less than 9,000, proved to be the most frequent form of technopathy. According to INAIL, this sudden rise, rather than the worsening of healthiness conditions in the workplaces, is due to several factors which have been contributing for years to the emergence of what experts call "hidden or lost diseases (i.e., unreported)”.

Table. 3 – Distribution of musculoskeletal diseases by job - Data MalProf 2000 - 2010

	Diseases of the rachis		*MSK diseases (excluding rachis and STC)*		*Carpal Tunnel Syndrome (STC)*		*Total*	
Economic activity (ATECO91)	**Valore**	**%**	**Valore**	**%**	**Valore**	**%**	**Valore**	**%**
Undefined	1637	23	1402	18	1376	26	4415	22
Artisans and skilled workers in the extractive industries and construction	1244	18	1228	16	343	7	2815	14
Artisans and skilled metal workers and assimilated	464	7	854	11	547	10	1865	9
Artisans and skilled workers food processing, wood, textiles, clothing, leather, leather and similar	271	4	1076	14	959	18	2306	12
Semi-skilled workers of stationary machines for working in series and workers involved in the mounting	210	3	617	8	528	10	1355	7
Conductors of vehicles, mobile machinery and lifting	696	10	135	2	50	1	881	4
Conductors of industrial plants	110	2	132	2	86	2	328	2
Elementary occupations of mining, construction and industrial activities	197	3	185	2	112	2	494	2
Skilled occupations in the social, cultural, security, cleaning and similar	340	5	356	5	168	3	864	4
Farmers and skilled workers of agriculture, forestry, animal husbandry, fishing and hunting	253	4	214	3	149	3	616	3
Other professions	1602	23	1432	19	906	17	3940	20
Total	7024	100	7631	100	5224	100	19879	100

Some sectors, such as agriculture, health and crafts, generally show a particular rise of these diseases while other sectors (such as fishing) are still struggling to bring out the work-related diseases.

The Apulia Region included in the Regional Plan for Prevention 2010 - 2012 initiatives in order to secure a better understanding of the tools both for the assessment of risk due to the biomechanical overload of the musculoskeletal system and for the prevention of the diseases related to them.

THE PROJECT

The Local Health Authority of Bari developed considerable long expertise in these issues thanks to the partnership with the EPM Research Unit Foundation Don Gnocchi - Milan (which is one of the main international point of reference in ergonomics and developed some of the international standards concerning the ergonomic risk assessment). In accordance with the Resolution no. 973 dated May 2011 of the General Manager of Local Health Authority of Bari, an agreement was approved for activities in cooperation with the Research Unit EPM Foundation Don Gnocchi Onlus of Milan and the University of Milan, so the South Section of the EPM International Ergonomics School started.
This South Section, in line with the same quality parameters of the same kind of Schools already opened in Milan, Pisa and in several foreign countries (Spain, France, Brazil and Argentina) started its activity by offering some training.
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Between 2012 and 2013 two training courses on the topics of Biomechanical overload of the musculoskeletal system were carried out particularly addressed to SPESAL (Services of Prevention and Safety in the Workplace) Health Workers of Apulia (physicians and technicians who work for prevention), as well as an edition of a similar course addressed to qualified physicians and business consultants.
No. 19 physicians and N. 40 prevention technicians belonging to the Local Health Authorities of Apulia were trained, together with no. 27 qualified physicians and no. 8 business consultants working as professionals.

The production of ergonomic insights on agricultural processes, typical of the territories of each Local Health Authority, is one of the requirements aimed to obtain final certificates of participation in these courses.
This approach allowed us to collect items of interest in order to better know the ergonomic risk in Apulian agriculture and to define the future prevention policies. At the end of these courses, an International Conference was held in Giovinazzo (Ba). On this occasion, the first results concerning the ergonomic analysis of many agricultural crops, were presented. These pre assessments are available on the Internet site of Apulia Region (http://www.sanita.puglia.it/portal/page/portal/SAUSSC/Prevenzione/Ergonomia%20e%20lavoro) with attachments concerning reference movies which led to these assessments. The goal is to make available these pre-assessments for workers of the agricultural sector (employers and consultants) using a software (under construction by EPM) which allows to weight the different tasks carried out in an annual cycle. The final figures will be a synthetic index of the exposure at risk as an annual average.

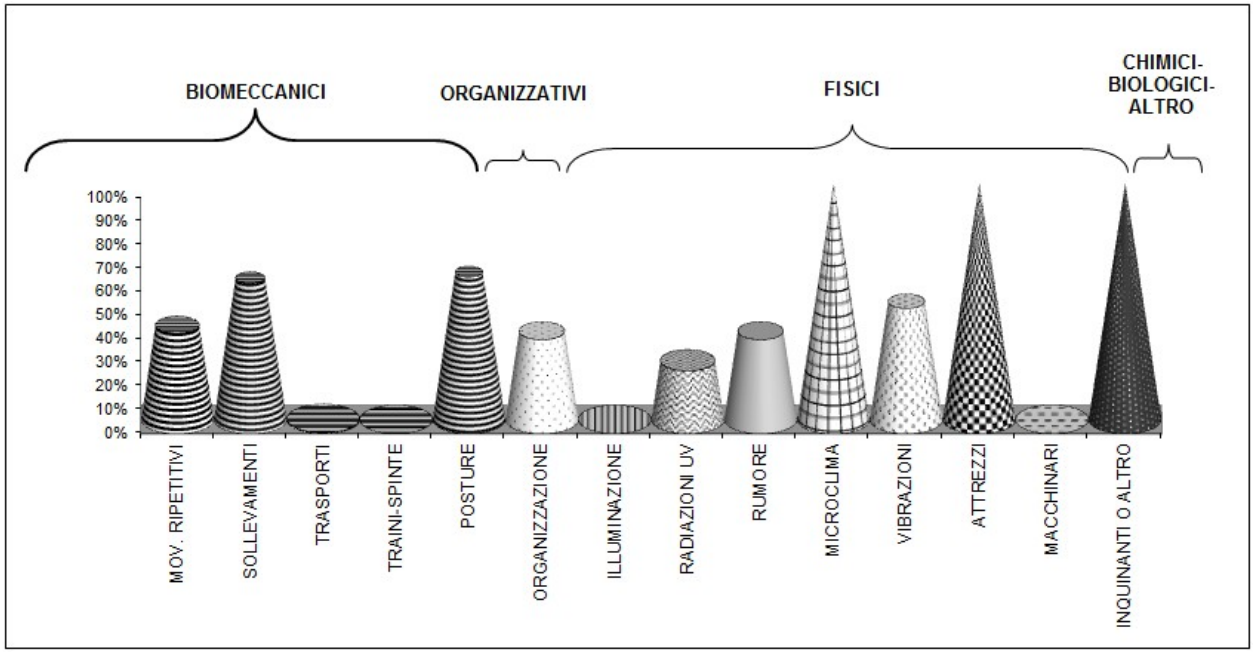
The Technical Committee of the Regions concerning safety at work places, aims to enhance expertise developed in Apulia extending it to the different working sectors. For this reason, in the next National Prevention Plan, a specific line of activities dedicated to the prevention of musculoskeletal disorders due to biomechanical overload, will be expected.
This work will be included in the National Plan for Prevention of Occupational Diseases to come, which will be developed in the different Italian regions.

THE RESULTS

At the moment we have studied the following crops: vegetables (fennel, tomatoes, cherry tomatoes in the greenhouse, cucumber, cauliflower, carrots, artichokes, potatoes, broccoli both from the point of view of cultivation than the packaging), fruit (grapes both from the point of view of cultivation than the packaging, cherries, peaches, watermelon, clementines, cantaloupes), olive, corn and crops in the nursery of flowers and plants.
We proceeded to the following stages for each studied cultivation:

- preliminary investigation by the method of preliminary mapping (which helped to identify the processes at increased risk for which necessitated a more thorough risk assessment) – Figure. 1

Figure. 1 – Preliminary mapping example in employee of chainsaw in cultivation of olives



- Study of the various processing stages, of the workforce employed in the different periods of the year and of the quantities of products used for the cultivation of crops and final – Pict. 2
- Analysis of the annual cycle of collection with the study of various intrinsic indices (Pict.. 3) of each task using the methods of the OCRA checklist and Niosh

Figure 2 – Example of organizational data in a company producing table grapes

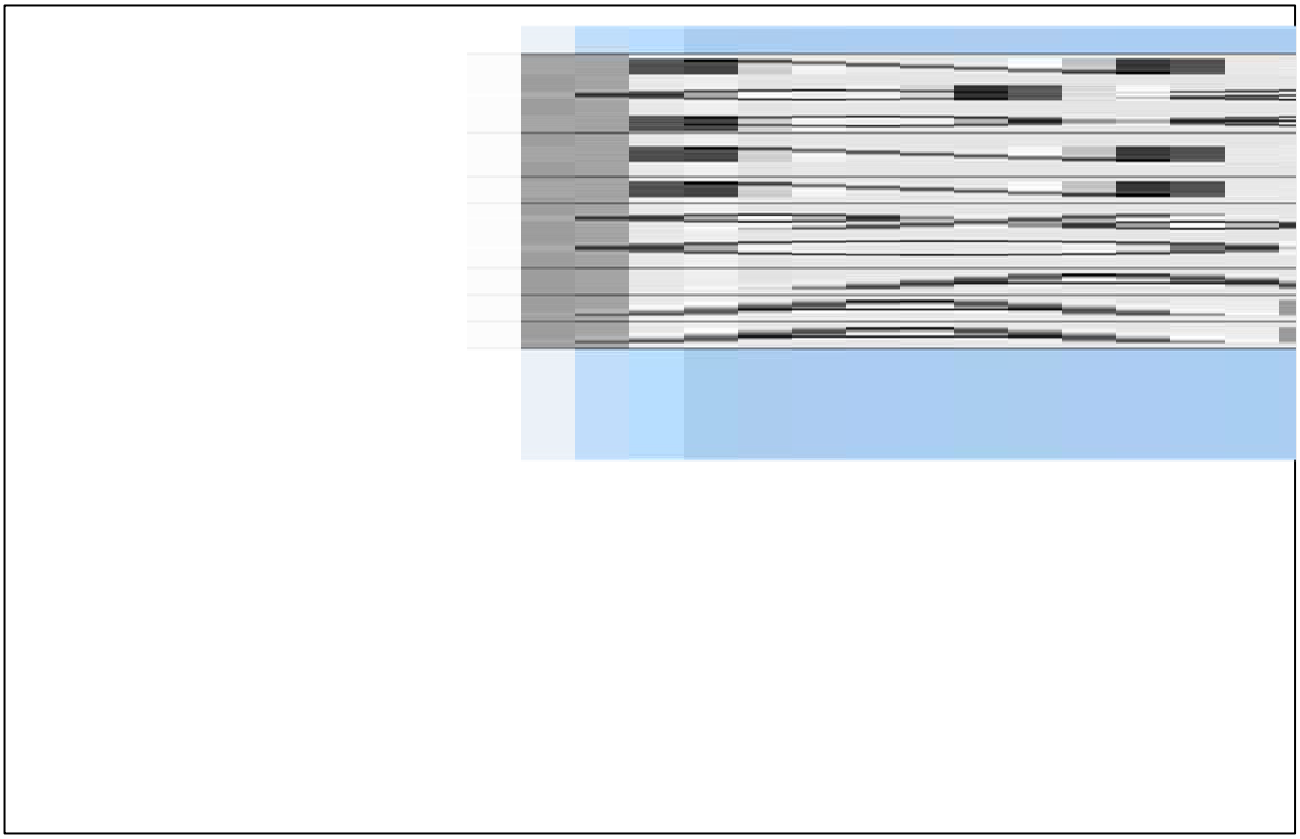


Figure. 3 – Example of intrinsic indices in a company producing table grapes

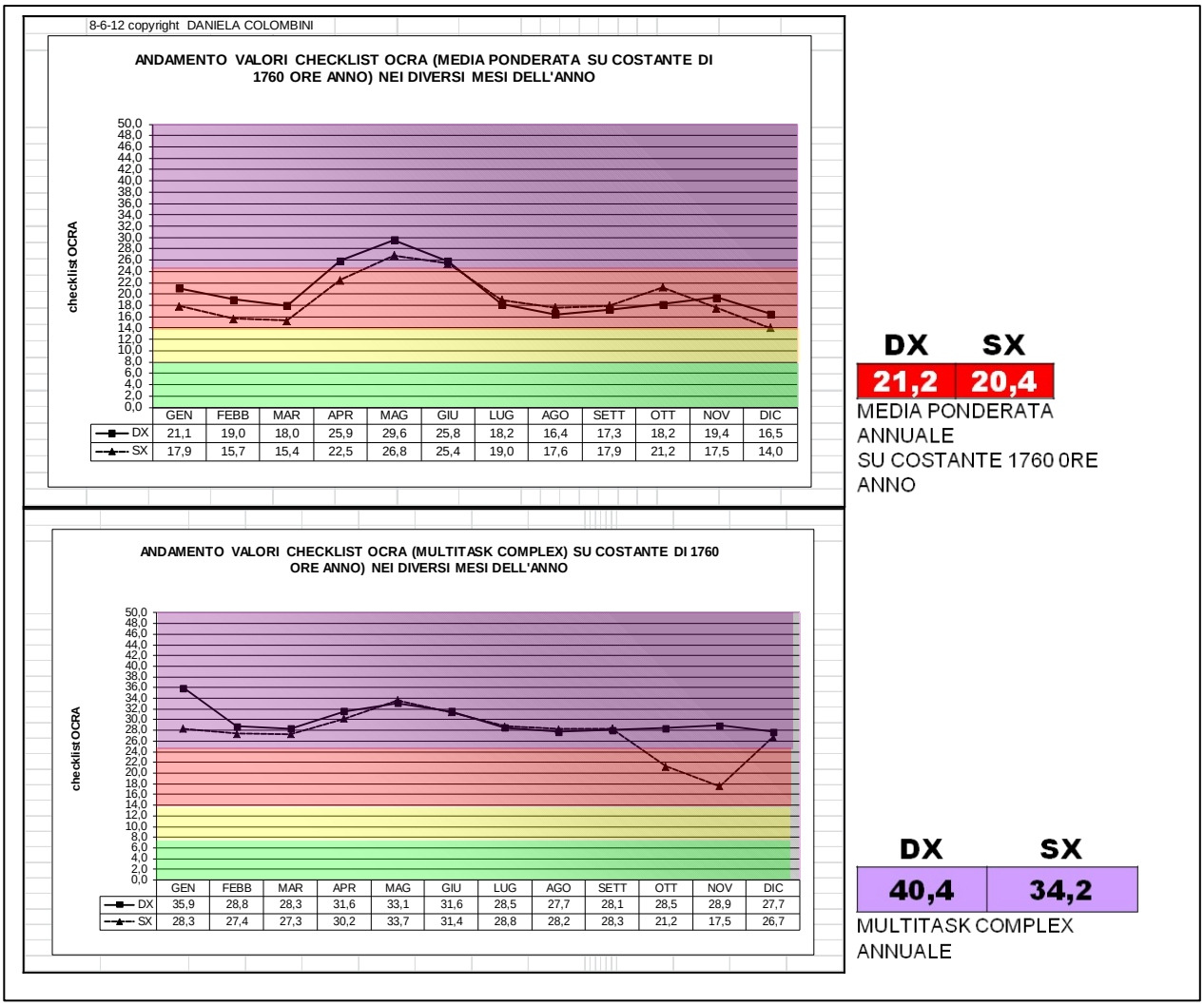
OPERAZIONE	Diradamento degli acini "acinino"
ATTREZZATURA	MANUALE
DESCRIZIONE DELL'OPERAZIONE	Consiste nella eliminazione dai grappoli degli acini in eccesso, malformati abortiti al fine di favorire il regolare sviluppo dei grappoli.

Mol. Rec.	recup	freq.	forza	lato	spalla	gomito	polso	mano	stereo	Tot. postu	compl	Check list OCRA
1,33	4	9	0	DX	12	0	4	3	3	15	0	31,92
1,33	4	9	0	SX	12	0	4	3	3	15	0	31,92

- Development of the synthetic index of annual risk for repetitive movements of the upper limbs and manual handling of loads (Figure. 4)
- Collection of any examples of ergonomic solutions freely identified from various growers in order to reduce the ergonomic load of the various operations

The intrinsic indices identified in the course of this project will be used to build (using a dedicated software) occupational exposure of each culture and define the specific synthetic index risk for the different farms. In other words, farms in which there are multiple crops throughout the year (for example, various types of vegetables and/or fruit) in respect of the various seasons and organization, will be able to calculate the annual synthetic risk of biomechanics overload of the musculoskeletal system using the different intrinsic indices previously calculated for the different work tasks.

Figure. 4 – Example of a synthetic annual index in a company producing flowers in greenhouses



CONCLUSIONS

The Puglia Region project has allowed to start studying the risk of biomechanical overload of the musculoskeletal system in some of the agricultural processing more frequent in the area.
It was possible to begin to experience the method of study of the OCRA checklist in an annual perspective, taking into account the peculiar variability of work tasks in this production sector. The farm operator in the space of a year is called to perform multiple tasks in different types of crops. The annual risk index must necessarily take into account the extreme variability of the indices of risk inherent in each task and exposure (in terms of time) to these occupational hazards. The weighted average, calculated as a function of exposure time in a year, of all these indices will provide us with the average exposure of individual workers to the risk of biomechanical overload of the musculoskeletal system.
To facilitate the calculation and use of these intrinsic indices, is being developed a special software with which you can calculate the synthetic index simply by copying the intrinsic indices previously evaluated for each task actually performed in the individual farm.
To do this, you will need to increase the number of tasks studied and the intrinsic indices previously evaluated.

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