



The management of the new and emerging musculoskeletal and psychosocial risks by EU-28 enterprises

Juan Carlos Aldasoro, María Luisa Cantonnet*

Faculty of Engineering of Gipuzkoa, Plaza de Europa 1, 2018 San Sebastián, Spain



ARTICLE INFO

Article history:

Received 14 January 2020
Received in revised form 13 January 2021
Accepted 15 March 2021
Available online 5 April 2021

Keywords:

New and emerging risks
Musculoskeletal
Psychosocial

ABSTRACT

Introduction: Although the strategic framework of the European Union in the field of Health and Safety at Work 2014–2020 considers as one of its main challenges to improve the prevention of diseases related to NERs (New and Emerging Risks) (European Commission, 2014) there are still not many studies in the literature related to them. **Method:** An exploratory study was carried out in order to get a picture of the NERs management in the EU-28 countries. The sample was extracted from the ESENER-2 datasets. ESENER-1 was carried out in 2009 and ESENER-2 in 2014. This survey explores managers' and workers representatives' opinions on health and safety management. It surveyed over 49,000 enterprises in 36 countries. **Results:** The results obtained confirm that there are significant differences between the EU-28 countries in terms of the identification and the management of NERs. Conclusions NERs are becoming an increasingly studied phenomenon due to the changes that are taking place in the labour market: the percentage of temporary workers is increasing, the demands to the workers due to the globalization of the market are more complex and all this with an aging working force. Practical Applications It would be necessary to rethink the management of OHS, so that managers are aware that the combination of musculoskeletal and psychosocial risks should have a global approach in order to reduce accident and disability rates.

© 2021 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

The comparison between countries in the field of occupational health and safety (OHS) management can be used to learn good practices and to achieve improvements (Morillas et al., 2013). And while the EU member countries share the same OHS European Directives (the Framework Directive on the “introduction of measures to encourage improvements in the safety and health of workers at work” is the European Council Directive No. 89/391/EEC), each country must transpose Directives into its own internal regulations. These transpositions could cause differences in OHS management practices between countries (Saksvik & Quinlan, 2003; Vassie et al., 2002). Furthermore, not all countries transposed the Directives at the same time. Scandinavian countries, for example, implemented the (OHS) management measures of the European Directive 89/391/EEC earlier than other European countries (Morillas et al., 2013).

There are studies in the literature that compare OHS management between European countries. These studies cover topics as

diverse as: labor stress (Daniels, 2004; Leka et al., 2008), health promotion for older workers (Magnavita, 2018), management of SMEs (Small and Medium Enterprises; Harms-Ringdahl et al., 2000; Vassie et al., 2002), or the burnout syndrome (Lastovkova et al., 2018). However, although the strategic framework of the European Union in the field of Health and Safety at Work 2014–2020 considers as one of its main challenges to improve the prevention of diseases related to NERs (New and Emerging Risks) (European Commission, 2014) there are still not many studies in the literature related to them.

The European Agency for Safety and Health at Work (EU-OSHA, 2010) defines an emerging risk as “any occupational risk that is both new and increasing.” “New” means (a) the risk did not previously exist and is caused by new types of workplaces, processes, technologies, or social or organizational change; (b) a long-standing issue is considered a new risk due to a change in social perceptions; or (c) the literature identifies as a risk a problem that had existed for a long time. The risk is “increasing” if the following criteria are met: (a) a number of hazards leading to risk is growing; (b) the likelihood of exposure to the hazard leading to risk is increasing (the level of exposure is rising and/or the number of workers exposed is increasing); or (c) the effect of the hazard on workers' health is escalating (e.g., health effects are becoming

* Corresponding author.

E-mail addresses: juancarlos.aldasoro@ehu.es (J.C. Aldasoro), marialuisa.cantonnet@ehu.es (M.L. Cantonnet).

more serious and/or the number of individuals affected is increasing). Emerging risks can be grouped into three different categories: newly created risks, newly identified risks, or increasing risks (Hernández et al., 2018).

However, there is a lack of consensus in the literature on the concept of NERs (Brocal et al., 2017; Cantonnet et al., 2019; Flage & Aven, 2015). The questionnaire used to carry out this study ESENER-2 (Second European Survey of Enterprises on New and Emerging Risks) itself mixes the so-called “traditional” and “new” risks (Brocal et al., 2017). Although one of the blocks of the questionnaire is entitled “new risks,” it can be observed that some of the questions included in it are related to traditional risks and not the new ones. ESENER-3 has been carried out in 2019 (after the development of this study) and its results are not currently available.

The objective of this article is to make a comparison between enterprises belonging to EU-28 in relation to the management of psychosocial and musculoskeletal NERs. For this purpose, a sample was extracted from the ESENER-2 datasets (Irastorza et al., 2016). The article is structured as follows: In the first part, we introduce the literature on psychosocial and musculoskeletal emerging risks and on OHS management comparisons. In the second part, we illustrate the methodology. Third, the main findings of the study are detailed. Finally, the main contributions of the paper, its practical implications, and avenues for future research are examined.

1.1. Psychosocial and musculoskeletal emerging risks

The emergence of new technologies will have deep impact on the world of work. Some studies have predicted that more than the 30% of jobs are at risk of automation (Lundberg, 2005). Therefore, psychosocial factors will be increasingly important because new technologies will change the types of work available; the pace of work; how, when, and where it is performed; and its complexity (Koppenborg et al., 2017; Stacey et al., 2018; Stamatogianni et al., 2019).

Workers' exposure to poor psychosocial environments influences not only workers' mental health but also their physical health (Bronkhorst, 2015; Fernandes & Pereira, 2016). The new psychosocial risks associated with the working world of the future (Industry 4.0) will be related to the stress of having to be connected and available 24/7 (Chia et al., 2019). This computer-based work will also lead to an increase in physical disorders such as MSDs (Stacey et al., 2018). Occupational stress has been related to other new psychosocial risks that include job insecurity, job demands, work overload or time pressure, lack of autonomy, and discrimination.

Time pressure is the most frequently reported psychosocial risk factor in the EU-28 (Irastorza et al., 2016). It is a psychosocial hazard often reported in professional, scientific, and technical activities and has also been related to workers burnout (Eurofound, 2018). A strong correlation between sector activities and the reported prevalence of psychosocial risks is found in the literature. Healthcare, education, and service sectors, for example, report a higher prevalence of psychosocial risks (van den Heuvel et al., 2018).

In the different scenarios that have been foreseen in relation to future work, job insecurity is present in most of them as an emerging risk (Stacey et al., 2018). Thus, job insecurity has been related to poorer mental health (Richter & Näswall, 2019; Vaughan-Jones & Barham, 2009).

With regard to the psychosocial risk of job demands, composed of both physical and psychological demands (complexity of the work), the interaction between the demands and the resources directly affects workers' levels of burnout (Nahrgang et al., 2011). The use of Information and Communication Technology could cause a mismatch between workers' physical and/or psychological

capabilities and work demands. Thus, advances in Artificial Intelligence may also lead to high performance demands (Bruyne & Gerritse, 2018; Stacey et al., 2018).

The introduction of new technologies in the workplace could also lead to a lack of autonomy (Ghislieri et al., 2018). Employees with less autonomy tend to be less proactive, which has been directly associated with lower psychosocial safety behavior (Bronkhorst, 2015). Wearable sensors or other monitoring technologies may also violate privacy and lead to discrimination (Bandodkar et al., 2016). Discrimination is another new psychosocial hazard that has been found to be a risk factor for mental health (Roberts et al., 2004). Thus, it tends to be higher among immigrant workers and females (Schütte et al., 2014; Sterud et al., 2018).

Literature has shown that workers who are exposed to psychosocial risks in combination with physical risks are more likely to suffer from MSDs (Bongers et al., 2006). From the analysis of the definitions provided by the EU-OSHA reports on emerging risks (Brun, 2007, 2009; Champoux & Brun, 2003; Flaspolder et al., 2005; Milczarek et al., 2007), it is observed that for a musculoskeletal physical risk to be considered as NER, it must be in combined exposure to psychosocial risks.

MSDs are influenced by a complex combination of physical and psychosocial factors in the work environment. Thus, most work-related MSDs develop over time and without a defined and single cause because their risk factors vary depending on the type of work (Anyfantis & Biska, 2018; Sundstrup et al., 2020). Examples of musculoskeletal occupational risk factors are: static postures, vibrations, and repetitive movements (Koukoulaki, 2014). Some studies suggest that implementing strength training at the workplace could reduce MSDs among employees with physically demanding works (Sundstrup et al., 2020).

Occupational stress, MSDs, and burnout are growing at all workplace levels and are expected to be even more thriving in the future (Ponce del Castillo & Meinert, 2016). Furthermore, the current European methodologies for managing the work-related stress risk factor could be ineffective and therefore the new and emerging psychosocial risks could require different and new methodologies to save employees' safety and health (Chirico, 2017) (Table 1).

1.2. Comparative studies between EU countries

To analyze the possible differences between EU areas, it is necessary to study the role of enterprises as well as the policies adopted by national governments (Magnavita et al., 2017). Comparisons between EU countries on the management of OHS have been made in research. Dollard and Neser (2013) and Verra et al. (2019) used the same survey as was used in this paper (but in its 2009 version) and concluded that the five European countries with the best psychosocial safety climate were: Sweden, Ireland, Finland, United Kingdom, and Denmark. They also stated that the labor market legislation of each country, the nature of each society, and the welfare regime, among other factors, could affect workers health.

Daniels (2004) did a comparative study on stress between EU Member countries and concluded that workers from different countries perceive stress differently. In other words, it could be said that the perception of work-related stress depends on the country in which the worker lives. Countries such as Finland, the Netherlands, Sweden, and the UK have shown high awareness in relation to work-related stress (Leka et al., 2008). Differences between EU countries have also been found when determining what is meant by the burnout syndrome because there are significant differences in the legislation of each country. Thus, the definition of the burnout syndrome is different depending on the country (Lastovkova et al., 2018).

Table 1
Overview of the literature on musculoskeletal and psychosocial emerging risks

Physical risks	Authors	Psychosocial risks	Authors
Physical risks associated with sedentary work	(Ponce del Castillo & Meinert, 2016; Stacey et al., 2018)	Burnout	Chia et al., 2019; Ponce del Castillo & Meinert, 2016; Stacey et al., 2018)
MSDs associated with the implementation of new technology	(Moore, 2019; Stamatiogianni et al., 2019)	Occupational stress	(Chia et al., 2019; Chirico, 2017; Daniels, 2004; Hargrove et al., 2011; Leka et al., 2008)
Loss of bone or muscle density from exoskeleton use	(Stacey et al., 2018)	Cognitive load	(Stacey et al., 2018)
		Time pressure	(Irastorza et al., 2016)
		Job insecurity	(Richter & Näswall, 2019; Vaughan-Jones & Barham, 2009)
		Digitalization	(Bandodkar et al., 2016; Bruyne & Gerritse, 2018)
		Complexity	(Koppenborg et al., 2017; Nahrgang et al., 2011)
MSDs	(Sundstrup et al., 2020; Anyfantis & Biska, 2018; Bongers et al., 2006; Koukoulaki, 2014)	Discrimination	(Bandodkar et al., 2016; Roberts et al., 2004)
		Autonomy	(Bronkhorst, 2015; Ghislieri et al., 2018)

Source: Prepared by the authors.

A study on the economic impact of MSDs in Europe stated that it is difficult to measure the impact of work disability caused by MSDs because there are differences between countries in the definition of what is meant by work disability and in collecting data methods (Bevan, 2015a). The same study stated that there is a lower prevalence of back pain attributable to work in northern European countries, as compared to countries like Greece, Slovenia, and Romania.

The management of OHS by European SMEs has also been studied in depth in the literature (Niskanen et al., 2012; Segarra Cañameres et al., 2017; Targoutzidis et al., 2014). A comparative study between Spanish and UK SMEs (Vassie et al., 2002) stated that despite the fact that each member country of the European Union has its own habits and customs, there are similarities between European SMEs when it comes to determining the difficulties they face with regard to OHS. The low prioritization of psychosocial risk management by SMEs was one of these similarities.

Some authors have explained the differences between European enterprises in the field of OHS based on the education and training of their workers, which would be different despite all being based on the same Directives (Spangenberg et al., 2003). However, in a study carried out in small European businesses on safety, health, and environmental issues, differences between the responses given by countries were not relevant, but differences in the number of responses obtained per country were remarkable. Sweden was the country with the most responses (Harms-Ringdahl et al., 2000).

Another aspect related to OHS that has been studied by the literature in which there are differences between EU countries is related to the aging workforce. The proportion of European workers aged 50 or more is two times that of those aged 25 years or younger (Bevan, 2015a). Central and Eastern Europe countries are adopting policies to promote actions for aged workers, but Mediterranean countries have not yet begun to apply these policies (Magnavita et al., 2017).

It can be stated that national dimensions affect the level of psychosocial risk management itself (van den Heuvel et al., 2018). In general, northern European countries seem to have a greater awareness to psychosocial risks than eastern European countries (EU-OSHA, 2010). Thus, there are also differences between European countries regarding the management of MSDs, which shows that the national dimension has an influence on the management of OHS.

2. Materials and methods

An exploratory study was carried out in order to get a picture of the NERs management in the UE-28 countries. More specifically, an

attempt was made to determine whether the EU-28 countries manage the NERs at the same pace and in a similar way, or if there are relevant differences.

Table 2
Interviewed workers classified by work position.

	Number	%
The owner or a partner of this firm	5749	13.88
The managing director, site or branch manager	6927	16.72
Another manager	8788	21.22
The health and safety officer	8665	20.92
An employee representative in charge of health and safety	2614	6.31
Another employee in charge of the subject	8522	20.57
An external health and safety consultant	157	0.38
Total	41,422	100

Source: Prepared by the authors.

Table 3
Universe, sample and sampling error of enterprises and by countries.

Country	Universe	Sample	S/U %	Error %
Austria	1,503	1,067	70.99	1.62
Belgium	1,504	1,147	76.26	1.41
Bulgary	750	419	55.87	3.18
Croatia	751	476	63.38	2.72
Cyprus	751	517	68.84	2.41
Czech Republic	1,508	822	54.51	2.31
Denmark	1,508	1,173	77.79	1.35
Estonia	750	596	79.47	1.82
Finland	1,511	1,306	86.43	1.00
France	2,256	1,791	79.39	1.05
Germany	2,261	1,749	77.36	1.12
Greece	1,503	895	59.55	2.08
Hungary	1,514	878	57.99	2.14
Italy	2,254	1,230	54.57	1.88
Lithuania	774	392	50.65	3.48
Luxembourg	752	536	71.28	2.27
Malta	452	334	73.89	2.74
Netherlands	1,519	1,157	76.17	1.41
Poland	2,257	1,437	63.67	1.56
Portugal	1,513	1,148	75.88	1.42
Republic of Ireland	750	554	73.87	2.13
Republic of Latvia	753	546	72.51	2.20
Romania	756	463	61.24	2.84
Slovakia	750	361	48.13	3.72
Slovenia	1,051	763	72.60	1.86
Spain	3,162	2,173	68.72	1.18
Sweden	1,521	1,232	81.00	1.22
United Kingdom	4,250	3,031	71.32	0.95
Total	40,584	28,193	69.47	0.32

Source: Prepared by the authors.

The objectives of this study were divided into two parts, as follows:

- 1) To identify if there are significant differences between the EU-28 countries in the identification and implementation of procedures related to the musculoskeletal and psychosocial NERs.
- 2) To compare the differences between the EU-28 countries regarding the weaknesses for the management of the NERs.

2.1. Sample

The sample was extracted from the ESENER-2 datasets. ESENER-1 was carried out in 2009 and ESENER-2 in 2014. This survey explores managers' and workers representatives' opinions on health and safety management. It surveyed over 49,000 enterprises in 36 countries (eight of which do not belong to the Economic Union: Albania, Iceland, Macedonia, Montenegro, Norway, Serbia, Switzerland, and Turkey). Only those countries belonging to the

EU have been selected, under the criterion that these countries follow a common framework for the prevention of occupational risks.

Table 2 shows that 37.94% of those interviewed were workers in managerial positions. Nearly 27% of the interviewed were workers in occupational risk prevention functions and 20.92% workers in intermediate-level positions.

The size of the universe and the sample by enterprise are shown in Table 3. The universe is made up of the enterprises interviewed in ESENER-2 database, however, only those enterprises located in the European Union have been taken into account, which amounts to a total of 40,584 enterprises. Thus, only those enterprises that answered affirmatively to all the items related to the identification of the NERs (Q200_1, Q200_2, Q200_4, Q201_1, Q201_2, Q201_3, Q201_4, Q201_5, Q201_6 and Q201_7) were selected. After applying this selection criterion, the final sample was composed of 28,193 companies. As it can be seen in Table 3, the overall sampling error is ±0.32% on average, with a 95% confidence level that can be considered acceptable for a solid statistical analysis.

Table 4
Selected items.

Topic	Item
	Country
Identification of emerging risks related to safety and health:	
Tell me if there is this risk factor at your establishment...	Q200_1: tiring or painful positions, including sitting for long periods Q200_2: Lifting or moving people or heavy loads Q200_4: Repetitive hand or arm movements Q201_1: Time pressure Q201_2: Poor communication or cooperation within the organisation Q201_3: Employees' lack of influence over their work pace or work processes Q201_4: Job insecurity Q201_5: Having to deal with difficult customers, patients, pupils, etc. Q201_6: Long or irregular working hours Q201_7: Discrimination, for example due to gender, age or ethnicity
Lack of resources to prevent emerging risks:	
Is your establishment lacking information or adequate preventive tools (to deal with them effectively)?	Q202_1: Tiring or painful positions, including sitting for long periods Q202_2: Lifting or moving people or heavy loads Q202_3: Loud noise Q202_4: Repetitive hand or arm movements Q202_5: Heat, cold or draught Q202_6: Risk of accidents with machines or hand tools Q202_10: Time pressure Q202_13: Job insecurity Q202_15: Long or irregular working hours Q202_16: Discrimination, for example due to gender, age or ethnicity
Lack of budget to face safety and health problems in the enterprise:	
	Q265_2: Is there any difficulty in addressing health and safety in your establishment caused by a lack of money?
Measures and procedures to deal with emerging risks related to psychosocial and musculoskeletal disorders:	
In the last 3 years, has your establishment used any of the following measures to prevent psychosocial risks?	Q300: Does your establishment have an action plan to prevent work-related stress? Q301: Is there a procedure in place to deal with possible cases of bullying or harassment? Bullying or harassment occurs when employees or managers are abused, humiliated or assaulted by colleagues or superiors. Q302: And is there a procedure to deal with possible cases of threats, abuse or assaults by clients, patients, pupils or members of the public?
Are any of the following preventive measures in place in your establishment?	Q303_1: Reorganisation of work in order to reduce job demands and work pressure Q303_2: Confidential counselling for employees Q303_3: Set-up of a conflict resolution procedure Q303_4: Intervention if excessively long or irregular hours are worked Q304: Were the measures taken triggered by concrete problems with stress, bullying, harassment or violence in the establishment?
	Q308_1: Equipment to help with the lifting or moving of loads or other physically heavy work Q308_2: Rotation of tasks to reduce repetitive movements or physical strain Q308_3: Encouraging regular breaks for people in uncomfortable or static postures including prolonged sitting Q308_4: Provision of ergonomic equipment, such as specific chairs or desks

Source: Prepared by the authors.

Only those enterprises that reported suffering simultaneously from physical and psychosocial risks (definition of NERs) were selected.

2.2. Measures

According to the aims of the study only those items related to the management of the musculoskeletal and psychosocial NERs by UE-28 enterprises were selected. In order to carry out the statistical analysis, the SPSS 23.0 package has been used. Some of the variables of this study are nominal and some are dichotomous. The items of the questionnaire had initially a nominal aspect, but they were transformed into ordinal ones in order to be analyzed by the non-parametric one-way Kruskal-Wallis test.

Taking into account the difficulties that the literature itself has in determining what is understood by emerging risk and what is understood by traditional risk, and that the questionnaire itself does not use the emerging term, the criterion used in analyzing the data was to recognize only as emerging musculoskeletal and psychosocial risks, those identified in the reports published by EU-OSHA (Reinert, Flapsoler, Hauke, & Brun, 2007).

Table 4 shows the selected items from ESENER-2 questionnaire. They have been classified in the following categories: country; identification of NERs; lack of resources to prevent NERs; lack of budget to manage NERs; measures and procedures implemented to manage new psychosocial risks and MSDs.

In this section, the results obtained for each of the objectives are presented:

Objective 1: To identify if there are significant differences between the EU-28 countries in the identification and implementation of procedures related to the NERs.

To generate this dichotomous variable (enterprises that identify NERs), items Q200_1, Q200_2, Q200_4, Q201_1, Q201_2, Q201_3, Q201_4, Q201_5, Q201_6 and Q201_7 were selected. In those cases

in which the responses have been affirmative for all items, it is considered that they do identify NERs. On the contrary, when the answers are negative in one or more of the items, it is considered that the NERs have not been identified. This is a demanding criterion since it could be that an enterprise that has responded no to one of the items, has nevertheless identified some of the NERs.

The distribution of enterprises that identify NERs by country (Table 5) shows a high variability between countries, with Finland standing out with a high percentage of NERs identification levels. In the other extreme, Slovakia shows the lowest percentage. From the 28 countries analyzed, it can be stated that 64% of them show NERs identification percentages above 66.66%, as the average implantation stands at 68% with a standard deviation of 10%. Countries that stand out with a high level of identification are Finland, Sweden, and France (around 80%), while Slovakia, Lithuania, the Czech Republic, and Italy show percentages below 60%.

Tables 6 and 7 present proportion of enterprises that implement procedures to address psychosocial risks (Q300; Q301; Q302; Q303_1; Q303_2, Q303_3, Q303_4 and Q304). Countries with the highest implementation rates are Belgium, Denmark, Finland, Republic of Ireland, Sweden, and the United Kingdom. On the other hand, countries that stand out with lower percentages of implantation are Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Poland, Portugal, and Slovakia.

Table 8 shows the results related to the implementation of procedures related to musculoskeletal NERs. As can be seen, countries with the lowest levels of implementation are Bulgaria, the Czech Republic, and Hungary.

Objective 2: To compare the differences between the EU-28 countries regarding the weaknesses for the management of the NERs.

Tables 9 and 10 show the weaknesses of dealing with NERs. Countries that stand out as having the lowest average percentage

Table 5
Distribution of enterprises that identify NERs by country.

COUNTRY	Identify NER's		Don't identify NER's		TOTAL
	Amount	Percentage	Amount	Percentage	
Austria	1067	70,99	436	29,01	1503
Belgium	1147	76,26	357	23,74	1504
Bulgary	419	55,87	331	44,13	750
Croatia	476	63,38	275	36,62	751
Cyprus	517	68,84	234	31,16	751
Czech Republic	822	54,51	686	45,49	1508
Denmark	1173	77,79	335	22,21	1508
Estonia	596	79,47	154	20,53	750
Finland	1306	86,43	205	13,57	1511
France	1791	79,39	465	20,61	2256
Germany	1749	77,36	512	22,64	2261
Greece	895	59,55	608	40,45	1503
Hungary	878	57,99	636	42,01	1514
Ireland	554	73,87	196	26,13	750
Italy	1230	54,57	1024	45,43	2254
Lithuania	546	72,51	207	27,49	753
Luxembourg	392	50,65	382	49,35	774
Malta	536	71,28	216	28,72	752
Netherlands	334	73,89	118	26,11	452
Poland	1157	76,17	362	23,83	1519
Portugal	1437	63,67	820	36,33	2257
Latvia	1148	75,88	365	24,12	1513
Romania	463	61,24	293	38,76	756
Slovakia	361	48,13	389	51,87	750
Slovenia	763	72,60	288	27,40	1051
Spain	2173	68,72	989	31,28	3162
Sweden	1232	81,00	289	19,00	1521
United Kingdom	3031	71,32	1219	28,68	4250

Source: Prepared by the authors.

Table 6
Proportion of enterprises that have implemented procedures related to the management of psychosocial NERs. Kruskal Wallis test.

	Q300			Q301			Q302			Q303_1			Q303_2			Q303_3		
	Firms	%	Sig. Bil.	Firms	%	Sig. Bil.	Firms	%	Sig. Bil.	Firms	%	Sig. Bil.	Firms	%	Sig. Bil.	Firms	%	Sig. Bil.
At	196	30,11	0.017	283	43,47	0.000	240	48,98	0.001	569	53,33	0.000	648	60,73	0.000	381	35,71	0.855
Be	342	43,85	0.000	672	86,15	0.000	399	68,79	0.000	508	44,29	0.604	671	58,50	0.000	559	48,74	0.000
Bg	94	36,43	0.803	51	19,77	0.000	56	32,56	0.000	165	39,38	0.063	98	23,39	0.000	98	23,39	0.000
Hr	20	7,27	0.000	157	57,09	0.705	95	52,78	0.157	184	38,65	0.004	133	27,94	0.000	121	25,42	0.000
Cy	71	27,20	0.003	90	34,48	0.000	103	47,69	0.011	257	49,71	0.038	261	50,48	0.002	226	43,71	0.001
Cz	39	7,54	0.000	145	28,05	0.000	151	44,54	0.000	179	21,78	0.000	141	17,15	0.000	224	27,25	0.000
Dk	432	57,91	0.000	459	61,53	0.001	387	68,25	0.000	700	59,68	0.000	722	61,55	0.000	447	38,11	0.259
Ee	32	9,36	0.000	54	15,79	0.000	91	36,40	0.000	272	45,64	0.718	244	40,94	0.095	97	16,28	0.000
Fi	340	40,77	0.001	685	82,13	0.000	336	72,10	0.000	842	64,47	0.000	926	70,90	0.000	618	47,32	0.000
Fr	456	43,20	0.000	482	44,71	0.000	492	56,29	0.927	714	39,87	0.002	1082	60,41	0.000	792	44,22	0.000
De	267	22,90	0.000	519	44,51	0.000	393	47,75	0.000	821	46,94	0.032	1029	58,83	0.000	534	30,53	0.000
El	47	11,38	0.000	115	27,85	0.000	116	38,28	0.000	423	47,26	0.027	486	54,30	0.000	402	44,92	0.000
Hu	128	23,75	0.000	80	14,84	0.000	85	27,42	0.000	331	37,70	0.000	339	38,61	0.005	248	28,25	0.000
Ie	200	49,26	0.000	390	96,06	0.000	274	86,16	0.000	301	54,33	0.000	238	42,96	0.650	297	53,61	0.000
It	446	55,13	0.000	295	36,46	0.000	180	34,95	0.000	575	46,75	0.085	374	30,41	0.000	389	31,63	0.002
Lt	62	26,72	0.005	74	31,90	0.000	63	41,18	0.000	144	36,73	0.004	173	44,13	0.921	130	33,16	0.261
Lu	45	14,75	0.000	121	39,67	0.000	81	33,61	0.000	240	44,78	0.921	307	57,28	0.000	168	31,34	0.018
Mt	78	33,91	0.735	150	65,22	0.004	114	59,69	0.511	208	62,28	0.000	241	72,16	0.000	154	46,11	0.000
Nl	241	31,92	0.060	606	80,26	0.000	382	77,64	0.000	407	35,18	0.000	614	53,07	0.000	424	36,65	0.450
Pl	178	17,35	0.000	455	44,35	0.000	249	36,14	0.000	356	24,77	0.000	327	22,76	0.000	373	25,96	0.000
Pt	136	18,81	0.000	138	19,09	0.000	190	33,93	0.000	449	39,11	0.002	322	28,05	0.000	240	20,91	0.000
Lv	74	22,16	0.000	78	23,35	0.000	108	42,86	0.000	230	42,12	0.442	222	40,66	0.144	145	26,56	0.000
Ro	144	48,48	0.000	83	27,95	0.000	79	41,58	0.000	205	44,28	0.925	222	47,95	0.171	231	49,89	0.000
Sk	37	16,67	0.000	54	24,32	0.000	63	42,86	0.000	131	36,29	0.001	84	23,27	0.000	108	29,92	0.015
Si	158	38,73	0.098	290	71,08	0.000	224	68,71	0.000	158	20,71	0.000	168	22,02	0.000	189	24,38	0.000
Es	455	39,33	0.007	603	52,12	0.014	363	46,54	0.000	968	44,55	0.651	779	35,85	0.000	721	33,18	0.004
Se	417	55,38	0.000	633	84,06	0.000	412	82,24	0.000	631	51,22	0.000	717	58,20	0.000	590	47,89	0.000
UK	1077	63,28	0.000	1636	96,12	0.000	1242	92,48	0.000	1524	50,28	0.000	1231	40,61	0.000	1314	43,35	0.000

Source: Prepared by the authors.

Legend: At: Austria. Be: Belgium. Bg: Bulgaria. Hr: Croatia. Cy: Cyprus. Cz: Czech Republic. Dk: Denmark. Ee: Estonia. Fi: Finland. Fr: France. De: Germany. El: Greece. Hu: Hungary. Ie: Ireland. It: Italy. Lt: Lithuania. Lu: Luxembourg. Mt: Malta. Nl: Netherlands. Pl: Poland. Pt: Portugal. Lv: Latvia. Ro: Romania. Sk: Slovakia. Si: Slovenia. Es: Spain. Se: Sweden. UK: United Kingdom.

Table 7
Proportion of enterprises that have implemented procedures related to the management of psychosocial NERs. Kruskal Wallis test.

	Q303_2			Q303_3			Q303_4			Q304		
	Firms	%	Sig. Bil.	Firms	%	Sig. Bil.	Firms	%	Sig. Bil.	Firms	%	Sig. Bil.
Austria	648	60,73	0.000	381	35,71	0.855	477	44,70	0.000	270	30,10	0.607
Belgium	671	58,50	0.000	559	48,74	0.000	321	27,99	0.012	331	35,90	0.000
Bulgary	98	23,39	0.000	98	23,39	0.000	71	16,95	0.000	27	11,74	0.000
Croatia	133	27,94	0.000	121	25,42	0.000	92	19,33	0.000	40	14,04	0.000
Cyprus	261	50,48	0.002	226	43,71	0.001	147	28,43	0.149	100	26,32	0.431
Czech Republic	141	17,15	0.000	224	27,25	0.000	154	18,73	0.000	71	18,16	0.000
Denmark	722	61,55	0.000	447	38,11	0.259	523	44,59	0.000	408	40,80	0.000
Estonia	244	40,94	0.095	97	16,28	0.000	125	20,97	0.000	75	19,95	0.001
Finland	926	70,90	0.000	618	47,32	0.000	637	48,77	0.000	662	58,90	0.000
France	1082	60,41	0.000	792	44,22	0.000	453	25,29	0.000	525	38,63	0.000
Germany	1029	58,83	0.000	534	30,53	0.000	841	48,08	0.000	436	31,34	0.379
Greece	486	54,30	0.000	402	44,92	0.000	235	26,26	0.004	160	24,13	0.185
Hungary	339	38,61	0.005	248	28,25	0.000	174	19,82	0.000	76	14,18	0.000
Ireland	238	42,96	0.650	297	53,61	0.000	247	44,58	0.000	152	34,55	0.033
Italy	374	30,41	0.000	389	31,63	0.002	375	30,49	0.548	87	10,66	0.000
Lithuania	173	44,13	0.921	130	33,16	0.261	206	37,73	0.001	58	14,99	0.000
Luxembourg	307	57,28	0.000	168	31,34	0.018	106	27,04	0.069	59	23,14	0.255
Malta	241	72,16	0.000	154	46,11	0.000	135	25,19	0.001	126	31,50	0.556
Netherlands	614	53,07	0.000	424	36,65	0.450	158	47,31	0.000	71	24,48	0.019
Poland	327	22,76	0.000	373	25,96	0.000	297	25,67	0.000	253	29,83	0.634
Portugal	322	28,05	0.000	240	20,91	0.000	272	18,93	0.000	106	14,38	0.000
Latvia	222	40,66	0.144	145	26,56	0.000	212	18,47	0.000	113	17,04	0.000
Romania	222	47,95	0.171	231	49,89	0.000	124	26,78	0.041	54	15,56	0.000
Slovakia	84	23,27	0.000	108	29,92	0.015	68	18,84	0.000	28	14,29	0.002
Slovenia	168	22,02	0.000	189	24,38	0.000	89	11,66	0.000	75	23,73	0.261
Spain	779	35,85	0.000	721	33,18	0.004	471	21,78	0.000	360	26,59	0.865
Sweden	717	58,20	0.000	590	47,89	0.000	578	46,92	0.000	369	35,11	0.072
United Kingdom	1231	40,61	0.000	1314	43,35	0.000	1070	35,30	0.015	623	28,36	0.165

Source: Prepared by the authors.

Table 8
Proportion of enterprises that have implemented procedures related to the management of musculoskeletal NERs. Kruskal Wallis test.

	Q308_1			Q308_2			Q308_3			Q308_4		
	Firms	%	Sig. Bil.	Firms	%	Sig. Bil.	Firms	%	Sig. Bil.	Firms	%	Sig. Bil.
Austria	596	92.69	0.000	284	44.58	0.000	788	73.85	0.472	913	85.57	0.000
Belgium	639	86.47	0.308	363	53.54	0.001	778	67.83	0.000	956	83.35	0.000
Bulgary	145	83.82	0.123	145	47.70	0.000	319	76.13	0.530	256	61.10	0.000
Croatia	213	79.18	0.000	185	54.57	0.071	377	79.20	0.028	353	74.16	0.008
Cyprus	222	82.84	0.016	203	50.75	0.000	384	74.27	0.684	371	71.76	0.000
Czech Republic	442	87.35	0.816	298	63.27	0.104	540	65.59	0.000	529	64.36	0.000
Denmark	701	92.24	0.000	512	61.39	0.457	786	67.01	0.000	1067	90.96	0.000
Estonia	340	84.37	0.039	228	56.30	0.158	547	91.78	0.000	511	85.74	0.000
Finland	785	96.32	0.000	538	52.49	0.000	1008	77.18	0.034	1107	84.76	0.000
France	1080	85.44	0.012	709	55.48	0.007	1199	66.95	0.000	1447	80.79	0.076
Germany	1068	91.67	0.000	641	52.20	0.000	1256	71.81	0.001	1395	79.76	0.566
Greece	369	76.72	0.000	326	50.00	0.000	597	66.70	0.000	663	74.08	0.000
Hungary	394	81.91	0.000	341	63.15	0.086	572	65.15	0.000	537	61.16	0.000
Ireland	380	91.57	0.016	237	66.95	0.005	467	84.30	0.000	460	83.03	0.030
Italy	703	88.32	0.579	356	58.36	0.582	940	76.42	0.192	986	80.16	0.421
Latvia	277	84.19	0.052	175	48.61	0.000	457	83.70	0.000	385	70.51	0.000
Lithuania	182	85.45	0.324	175	60.76	0.732	315	80.36	0.011	244	62.24	0.000
Luxembourg	280	83.83	0.031	162	48.21	0.000	335	62.50	0.000	378	70.52	0.000
Malta	208	93.69	0.006	114	56.44	0.355	267	79.94	0.033	267	79.94	0.750
Netherlands	593	92.37	0.000	672	78.14	0.000	878	75.89	0.489	1026	88.68	0.000
Poland	563	84.03	0.002	541	58.11	0.387	987	68.68	0.000	1250	86.99	0.000
Portugal	667	86.96	0.539	439	55.71	0.036	757	65.94	0.000	849	73.95	0.000
Romania	178	77.73	0.000	171	61.51	0.466	358	77.32	0.229	345	74.51	0.012
Slovakia	161	77.03	0.000	86	36.91	0.000	247	68.42	0.006	227	62.88	0.000
Slovenia	424	88.52	0.602	298	53.60	0.006	571	74.84	0.954	561	73.53	0.000
Spain	1222	87.98	0.746	961	63.77	0.000	1630	75.01	0.816	1854	85.32	0.000
Sweden	720	92.19	0.000	424	55.50	0.023	960	77.92	0.017	1106	89.77	0.000
United Kingdom	2082	87.19	0.347	1588	78.38	0.000	2717	89.64	0.000	2462	81.23	0.005

Source: Prepared by the authors.

of weaknesses are Bulgaria, Estonia, Cyprus, the Czech Republic, and Slovenia. On the other hand, countries that stand out as having the highest average percentage of weaknesses are Belgium, France, Greece, Hungary, Italy, Malta, Poland, and Portugal.

It should also be stated that countries such as Greece, Italy, Cyprus, and France have more budget limitations than the rest of the countries in the sample.

The overall results have been classified into four quartile categories. For this purpose, an arithmetic average has been elaborated for each country with the items that compose Table 4 on one hand, and Tables 5–7 on the other.

A visual scheme summarizes the results obtained in Tables 4–7 has been obtained. Countries belonging to northern Europe and the Atlantic islands are the most advanced in adopting procedures related to NERs, while Central European and Mediterranean countries have lower percentages of implementation.

Table 11 presents a classification of the percentages of enterprises that responded affirmatively to the identification of NERs, to the implementation of management measures, and to the existence of weaknesses in managing them. Table 8 also shows which countries have the greatest difficulties in managing NERs and which are in a more favorable position. To this end, the items that make up each group of variables were chosen (see methodology) and the resulting arithmetic means were classified in the quartiles corresponding to each of the groups of items.

Table 11 shows four groups of countries with different profiles in terms of identification and management of NERs. The first group would be formed by those countries that are in the highest quartile in terms of identification and management of NERs, and in the lowest quartile in terms of the identification of deficiencies to manage them. In this first group, countries such as Denmark, Finland, Sweden, and the United Kingdom can be mentioned. The second group would be formed by countries that stand out for a low percentage in the identification and management of NERs and a high percent-

age in the identification of deficiencies. These countries are Greece, Hungary, Italy, and Poland.

The third group is made up of countries that, although they present medium–high percentages in the identification and management of NERs, also stand out for identifying shortcomings in managing them, and therefore have difficulties in managing NERs. Among them, Belgium, Germany, the Republic of Ireland, and Malta stand out.

The last group is formed of countries that do not make significant efforts in the identification and management of NERs and therefore, identify to a lesser extent, deficiencies to manage them. This last group includes countries such as Bulgaria, the Czech Republic, and Lithuania.

3. Discussion

Changes in the type of future work will lead to an increase in new risks of psychosocial origin (Koppenborg et al., 2017; Stacey et al., 2018; Stamatogianni et al., 2019). Likewise, the increase in psychosocial risks will have a negative impact not only on workers' mental health, but also on their physical health (Bronkhorst, 2015; Fernandes & Pereira, 2016). Workers exposed to psychosocial risks in combination with physical risks will be more likely to suffer from MSDs (Bongers et al., 2006).

The specific characteristics of a society can also affect workers' health (Dollard & Neser, 2013). Although European countries share the same legislation, differences can be found between them. Northern European countries seem to have a greater awareness to psychosocial risks (EU-OSHA, 2010). Thus, there is a lower prevalence of back pain attributable to work in northern European countries (Bevan, 2015a).

In this study, four groups of countries have been identified for their different degrees in identifying, managing, and observing

Table 9
Weaknesses in dealing with NERs. Kruskal Wallis test.

	Q202-1			Q202-2Q202-2			Q202-3			Q202-4			Q202-5			Q202-6		
	Fir	%	Sig	Fir	%	Sig	Fir	%	Sig	Fir	%	Sig	Fir	%	Sig	Fir	%	Sig
	ms	.	Bil	ms	.	Bil	ms	.	Bil	Ms	.	Bil	ms	.	Bil	ms	.	Bil
At	12	14.	0.3	65	10.	0.6	45	10.	0.9	98	15.	0.1	62	12.	0.6	54	9.3	0.5
	1	35	53		11	77		14	81		38	55		78	22	3	5	02
	26	29.	0.0	18	25.	0.0	10	25.	0.0	21	31.	0.0	13	27.	0.0	49	26.	0.0
Be	7	67	00	9	58	00	4	49	00	4	56	00	4	57	00	2	68	00
	14	4.8	0.0	3	1.7	0.0	4	3.5	0.0	10	3.2	0.0	5	3.4	0.0	21	2.6	0.0
Bg	2	00		3	00		7	00		9	00		0	00		7	9	02
	65	17.	0.0	42	15.	0.0	22	14.	0.0	55	16.	0.1	36	15.	0.3	26	13.	0.0
Hr	47	17		61	01		67	67		22	37		52	75		0	04	06
	33	10.	0.1	5	1.8	0.0	5	4.2	0.0	42	10.	0.0	15	6.4	0.0	29	2.9	0.0
Cy	28	10		7	00		0	30		50	78		4	01		3	8	00
	40	7.8	0.0	15	2.9	0.0	9	2.7	0.0	10	18.	0.0	17	4.7	0.0	57	8.2	0.0
	4	00		6	00		5	00		4	12	00		5	00	1	0	00
Cz																		
	86	10.	0.0	67	8.8	0.4	53	10.	0.6	95	11.	0.0	97	13.	0.7	63	5.4	0.0
Dk	67	26		2	37		73	75		39	71		20	82		8	8	03
	20	4.3	0.0	8	1.9	0.0	3	1.3	0.0	10	2.4	0.0	11	3.3	0.0	35	1.6	0.0
Ee	6	00		9	00		2	00		7	00		6	00		6	6	00
	12	11.	0.1	71	8.7	0.3	40	6.8	0.0	11	11.	0.0	11	14.	0.5	70	8.3	0.7
Fi	7	86	59	1	63		3	06		7	41	47	6	25	42	6	1	78
	44	29.	0.0	26	21.	0.0	15	20.	0.0	40	31.	0.0	21	21.	0.0	95	16.	0.0
Fr	4	21	00	7	12	00	1	05	00	5	69	00	1	84	00	5	59	00
	15	11.	0.0	13	11.	0.0	86	9.0	0.2	16	13.	0.6	90	10.	0.0	10	93.	0.0
	4	73	87	1	24	55		7	46	1	11	91		29	04	43	38	16
De																		
	16	29.	0.0	95	19.	0.0	48	8.1	0.0	18	28.	0.0	93	26.	0.0	38	78.	0.0
El	2	35	00		75	00		3	00	6	53	00		12	00	7	18	00
	85	13.	0.8	49	10.	0.6	37	25.	0.0	74	13.	0.8	48	11.	0.2	54	92.	0.5
Hu	02	37		19	76		13	29		70	82		71	72		5	06	65
	51	14.	0.6	27	6.5	0.0	20	9.3	0.6	42	11.	0.3	37	14.	0.7	31	91.	0.7
le	17	20		1	29		5	88		86	67		34	04		5	84	75
	92	9.9	0.0	47	5.9	0.0	17	4.0	0.0	89	14.	0.4	68	15.	0.2	68	97.	0.0
It	0	02		0	00		8	00		59	19		56	10		1	42	00
	26	5.7	0.0	16	4.8	0.0	8	4.2	0.0	19	5.2	0.0	20	6.0	0.0	29	97.	0.0
Lv	9	00		6	03		1	06		8	00		2	00		8	07	00
	16	6.1	0.0	10	4.6	0.0	9	6.7	0.1	17	5.9	0.0	12	6.4	0.0	22	96.	0.0
Lt	8	01		9	14		2	84		0	00		2	04		3	54	05
	77	18.	0.0	50	14.	0.0	28	13.	0.1	49	14.	0.5	35	12.	0.5	28	89.	0.3
		55	01		97	01		40	20		58	54		24	17	4	87	26
Lu																		
	68	29.	0.0	55	24.	0.0	24	26.	0.0	52	25.	0.0	43	27.	0.0	13	77.	0.0
Mt	57	00		77	00		37	00		74	00		22	00		4	46	00
	82	9.5	0.0	39	6.0	0.0	28	6.3	0.0	97	11.	0.0	95	15.	0.2	60	95.	0.0
		0	01		7	02		3	07		28	53		22	09	1	85	00
NI																		
	14	12.	0.2	48	7.1	0.0	39	6.2	0.0	10	11.	0.0	70	11.	0.0	74	94.	0.0
Pl	1	19	59		6	28		0	01	3	06	27		25	89	8	44	02
	16	17.	0.0	89	11.	0.0	61	11.	0.3	12	15.	0.1	75	13.	0.8	66	90.	0.3
Pt	7	20	00		60	59		49	04	0	23	45		86	22	0	53	91
	28	7.2	0.0	12	5.2	0.0	8	7.3	0.3	18	6.4	0.0	15	7.7	0.0	25	94.	0.0
Ro	9	00		4	23		4	26		7	01		7	18		3	76	49
	27	12.	0.0	10	4.7	0.0	6	4.5	0.0	21	9.0	0.0	17	10.	0.2	19	91.	0.7
Sk	92	75		8	17		5	32		1	44		63	79		4	94	81
	6	1.0	0.0	5	1.0	0.0	6	2.2	0.0	9	1.6	0.0	6	1.4	0.0	48	98.	0.0
Si	7	00		4	00		5	00		2	00		6	00		1	16	00
	10	5.0	0.0	62	4.4	0.0	37	5.2	0.0	10	6.9	0.0	78	8.2	0.0	12	96.	0.0
Es	0	7	00		6	00		6	00	5	7	00		4	00	25	08	00
	81	8.7	0.0	55	7.0	0.0	52	8.8	0.8	93	12.	0.2	10	16.	0.0	64	94.	0.0
Se	1	00		4	12		9	27		17	79		1	11	55	8	60	02
	17	9.0	0.0	98	4.1	0.0	81	5.5	0.0	17	8.6	0.0	15	11.	0.0	17	95.	0.0
	4	1	00		0	00		1	00	5	4	00	3	07	05	02	08	00
Uk																		

Source: Prepared by the authors

gaps in the management of NERs. The results obtained confirm that there are significant differences between the EU-28 countries in terms of the identification and the management of NERs. There is a group of countries that have higher percentages of enterprises that manage NERs (some northern European countries and the islands of the Atlantic Ocean). On the other hand, some eastern

European and Mediterranean countries have lower percentages of enterprises that manage NERs. Thus, it is the southern European countries that perceive the greatest weaknesses and limitations in the management of NERs.

With regard to psychosocial risks, the results of this study show that some northern European countries are the ones that manage

Table 10
Relation between the proportion of enterprises by country and the lacks of information or budget to deal with NERs. Kruskal Wallis test.

	Q202-10			Q202-13			Q202-15			Q202-16			Q265-2		
	Fir ms		Sig. Bil.	%	%	Sig. Bil.	Fir ms	%	Sig. Bil.	Fir ms	%	Sig. Bil.	Firms major difficult ies	%	Sig. Bil.
At	188	23.41	0.018	43	31.85	0.037	63	20.45	0.196	10	32.26	0.187	128	12.00	0.000
Be	298	38.70	0.000	95	47.74	0.000	115	32.21	0.000	35	44.86	0.000	359	31.30	0.061
Bg	10	4.39	0.000	4	3.96	0.000	4	5.88	0.011	0	00.00	0.590	140	33.41	0.002
Hr	60	20.55	0.853	69	27.52	0.247	12	13.19	0.259	2	22.22	0.986	157	32.98	0.000
Cy	32	10.13	0.000	23	16.43	0.030	23	11.17	0.013	4	16.67	0.492	194	37.52	0.000
Cz	30	8.80	0.000	36	9.76	0.000	20	7.78	0.000	2	25.00	0.864	168	20.44	0.188
Dk	285	21.41	0.203	68	17.22	0.001	55	9.63	0.000	11	16.42	0.223	199	16.97	0.000
Ee	12	3.21	0.000	6	3.00	0.000	6	3.53	0.000	1	16.67	0.733	156	26.17	0.055
Fi	251	21.68	0.174	157	29.62	0.003	72	15.72	0.260	17	25.00	0.608	168	12.86	0.000
Fr	388	38.11	0.000	99	32.14	0.001	157	25.40	0.000	39	43.82	0.000	635	35.46	0.000
De	285	21.41	0.223	48	17.71	0.011	117	20.31	0.090	11	23.91	0.812	216	12.35	0.000
El	153	25.76	0.001	84	31.23	0.006	70	22.95	0.015	7	24.14	0.828	396	44.25	0.000
Hu	87	20.09	0.990	58	29.44	0.083	43	19.46	0.486	2	28.57	0.698	195	22.21	0.135
Ie	63	17.95	0.307	30	24.00	0.956	38	17.35	0.896	3	11.11	0.153	130	23.47	0.002
It	110	21.74	0.357	154	40.74	0.000	57	25.22	0.003	9	37.50	0.075	510	41.46	0.000
Lv	28	9.89	0.000	36	17.82	0.032	17	9.39	0.003	1	14.29	0.603	120	21.98	0.503
Lt	14	10.77	0.008	7	8.05	0.000	6	8.00	0.027	1	16.67	0.733	136	34.69	0.000
Lu	51	14.53	0.008	15	19.48	0.331	32	17.39	0.916	9	37.50	0.075	62	11.57	0.000
Mt	67	29.65	0.000	11	35.48	0.142	30	28.04	0.005	1	12.50	0.498	93	27.84	0.378
Nl	185	19.43	0.590	119	31.56	0.001	64	15.06	0.148	13	13.98	0.042	317	27.40	0.079
Pl	155	17.63	0.061	113	29.05	0.022	66	22.37	0.032	7	53.85	0.006	449	31.25	0.000
Pt	156	23.96	0.013	128	30.12	0.004	81	23.01	0.008	9	36.00	0.102	386	33.62	0.000
Ro	29	12.08	0.002	16	13.56	0.007	20	9.85	0.003	2	28.57	0.698	155	33.45	0.008
Sk	28	12.50	0.004	14	14.58	0.027	12	10.53	0.044	1	25.00	0.904	106	29.36	0.033
Si	11	2.56	0.000	6	3.21	0.000	6	2.78	0.000	1	10.00	0.343	175	22.94	0.668
Es	191	17.56	0.030	95	19.67	0.016	123	22.69	0.002	9	26.47	0.572	609	28.03	0.223
Se	233	21.63	0.202	65	20.97	0.175	93	18.06	0.820	17	12.59	0.004	245	19.89	0.002
Uk	351	19.21	0.313	205	28.91	0.002	208	15.90	0.072	27	9.75	0.000	467	15.41	0.000

Source: Prepared by the authors

Table 11
Percentage of enterprises that answer affirmatively to the identification and management of NERs, and to their deficiencies. Distribution in quartiles and by countries

País	Identifican NERs	Implantan medidas gestionar NERs	Identifican carencias gestión NERs
Austria	2	3	2
Belgium	4	3	4
Bulgary	1	1	1
Croatia	2	2	2
Cyprus	2	3	1
Czech Republic	1	1	1
Denmark	4	4	1
Estonia	4	1	1
Finland	4	4	1
France	4	3	4
Germany	4	3	3
Greece	1	2	4
Hungary	1	1	3
Ireland	3	4	3
Italy	1	2	4
Latvia	3	2	2
Lithuania	1	2	2
Luxembourg	2	2	3
Malta	3	4	4
Netherlands	3	3	3
Poland	2	1	4
Portugal	3	1	4
Romania	2	3	2
Slovakia	1	1	2
Slovenia	3	2	1
Spain	2	3	3
Sweden	4	4	3
United Kingdom	3	4	2

Source: Prepared by the authors.

the NERs the most. These results coincide with those of previous comparative studies, which showed that there are significant differences between EU member countries in the management of psy-

chosocial risks and MSDs (Bevan, 2015b; Daniels, 2004; Dollard & Nesar, 2013; van den Heuvel et al., 2018).

Similar studies suggest that almost all northern European countries, particularly Finland, Sweden, the Netherlands, and the United Kingdom, are more concerned about work-related stress and psychosocial risks than other European countries (Leka et al., 2008).

Concerning the weaknesses that companies declare to have, it is interesting to note that it is not the countries that least manage the NERs that claim to have the most weaknesses. These results would coincide with previous studies in the literature that show that the fact of not finding deficiencies in the management of OHS is not due to good management practices, but because there is lack of knowledge on OHS (Champoux & Brun, 2003).

This study has some limitations. The first is related to the difficulty of determining what is specifically meant by NERs, the second is the fact that the study was reduced to two types of NERs (musculoskeletal and psychosocial), leaving the analysis of the rest of the NERs to future studies.

4. Conclusion

It can be stated that there are cultural differences between EU member countries, despite the fact that they share the same Directives. Studies show that even workers' perceptions change depending on the country in which they work (Daniels, 2004). These differences would justify such disparate results among countries sharing the same normative framework.

Comparative studies between countries face the difficulty that the studied countries do not always share the same definitions nor the same methodologies in the data collection. Therefore, for future studies, it would be recommended, when carrying out comparative studies between EU countries, to draw up a multifactorial model in which national cultural variables and NERs could be related.

The contribution of this paper is that, for the first time, a comparative study on the identification and management of NERs between EU countries has been made. However, one of the weaknesses of this study is that there are few studies in the literature on NERs, which, together with the fact that the definition of new risks itself is not clear, leads to many companies not being clear on what a new risk is.

Uncertainty in relation to NERs does not help European enterprises manage this type of risk effectively. Thus, it is necessary to rethink the management of OHS, so that managers are aware that the combination of musculoskeletal and psychosocial risks should have a global approach in order to reduce accident and disability rates.

To conclude, it can be noted that NERs are becoming an increasingly studied phenomenon due to the changes that are taking place in the labor market: the percentage of temporary workers is increasing, the demands to the workers due to the globalization of the market are more complex, and all this with an aging workforce. For this reason, the authors of this study consider that comparative studies between countries could help to improve practices in this area.

References

- Anyfantis, I. D., & Biska, A. (2018). Musculoskeletal disorders among Greek physiotherapists: Traditional and emerging risk factors. *Safety and Health at Work*, 9(3), 314–318. <https://doi.org/10.1016/j.shaw.2017.09.003>.
- Bandodkar, A. J., Jeerapan, I., & Wang, J. (2016). Wearable chemical sensors: Present challenges and future prospects. *ACS Sensors*, 1(5), 464–482. <https://doi.org/10.1021/acssensors.6b00250>.
- Bevan, S. (2015a). Economic impact of musculoskeletal disorders (MSDs) on work in Europe. Elsevier. <https://www.sciencedirect.com/science/article/pii/S1521694215000947>.
- Bevan, S. (2015b). Economic impact of musculoskeletal disorders (MSDs) on work in Europe. *Best Practice & Research Clinical Rheumatology*, 29(3), 356–373. <https://doi.org/10.1016/j.BERH.2015.08.002>.
- Bongers, P., Ijmker, S., & Van den Heuvel (2006). *Epidemiology of work related neck and upper limb problems: Psychosocial and personal risk factors (part 1) and effective interventions from a bio behavioural*. Springer.
- Brocac, F., Sebastián, M. A., & González, C. (2017). Theoretical framework for the new and emerging occupational risk modeling and its monitoring through technology lifecycle of industrial processes. *Safety Science*, 99, 178–186. <https://doi.org/10.1016/j.SSCI.2016.10.016>.
- Bronkhorst, B. (2015). Behaving safely under pressure: The effects of job demands, resources, and safety climate on employee physical and psychosocial safety behavior. *Journal of Safety Research*, 55, 63–72. <https://doi.org/10.1016/j.jsr.2015.09.002>.
- Brun, E. (2007). Expert forecast on emerging biological risks related to occupational safety and health. https://scholar.google.es/scholar?hl=es&as_sdt=0%2C5&q=Brun%2C+E.%2C+2007.+Expert+forecast+on+emerging+biological+risk+related+to+occupational+safety+and+health.+Office+for+official+publications+of+the+European+communities.&btnG=
- Brun, E. (2009). Expert forecast on emerging chemical risks related to occupational safety and health. <http://senas.lnb.lt/stotisFiles/uploadedAttachments/es13200932903620.pdf>.
- Bruyne, E., & Gerritse, D. (2018). Exploring the future workplace: Results of the futures forum study. *Journal of Corporate Real Estate*, 20(3), 196–213. <https://doi.org/10.1108/JCRE-09-2017-0030>.
- Cantonnet, M. L., Aldasoro, J. C., & Iradi, J. (2019). New and emerging risks management in small and medium-sized Spanish enterprises. *Safety Science*, 113, 257–263. <https://doi.org/10.1016/j.ssci.2018.11.032>.
- Champoux, D., & Brun, J.-P. (2003). Occupational health and safety management in small size enterprises: An overview of the situation and avenues for intervention and research. *Safety Science*, 41(4), 301–318. [https://doi.org/10.1016/S0925-7535\(02\)00043-7](https://doi.org/10.1016/S0925-7535(02)00043-7).
- Chia, G., Lim, S. M., Sng, G. K. J., Hwang, Y.-F. J., & Chia, K. S. (2019). Need for a new workplace safety and health (WSH) strategy for the fourth Industrial Revolution. *American Journal of Industrial Medicine*, 62(4), 275–281. <https://doi.org/10.1002/ajim.v64.10.1002/ajim.22960>.
- Chirico, F. (2017). The forgotten realm of the new and emerging psychosocial risk factors. *Journal of Occupational Health*, 59(5), 433–435. <https://doi.org/10.1539/joh.17-0111-OP>.
- Daniels, K. (2004). Perceived risk from occupational stress: A survey of 15 European countries. *Occupational and Environmental Medicine*, 61(5), 467–470. <https://doi.org/10.1136/oem.2003.009142>.
- Reinert, D., Flapsoler, E., Hauke, A., Brun E. Identification of emerging occupational safety and health risks. *Saf. Sci. Mon.*, 11 (3) (2007), pp. 1–17.
- Dollard, M. F., & Nesar, D. Y. (2013). Worker health is good for the economy: Union density and psychosocial safety climate as determinants of country differences in worker health and productivity in 31 European countries. *Social Science and Medicine*, 92, 114–123. <https://doi.org/10.1016/j.socscimed.2013.04.028>.
- EU-OSHA. (2010). European Risk Observatory Report. European Survey of Enterprises on New and Emerging Risks (ESENER). Managing safety and health at work. 152. https://osha.europa.eu/en/node/6745/file_view.
- Eurofound. (2018). Burnout in the workplace: A review of data and policy responses in the EU. In Publication office of the European Union. 10.2806/957351.
- European Commission. (2014). ESENER-2 Final Master Questionnaire. 18.
- Fernandes, C., & Pereira, A. (2016). Exposure to psychosocial risk factors in the context of work: A systematic review. *Revista de Saude Publica*, 50, 24. <https://doi.org/10.1590/S1518-8787.2016050006129>.
- Flage, R., & Aven, T. (2015). Emerging risk - Conceptual definition and a relation to black swan type of events. *Reliability Engineering and System Safety*, 144, 61–67. <https://doi.org/10.1016/j.res.2015.07.008>.
- Flapsoler, E., Brun, E., Hinker, M., Pierens, K., & Lindstrom, K. (2005). Expert Forecast on Emerging Physical Risks Related to Occupational Safety and Health. <https://arrow.dit.ie/schfsehrep/4/>.
- Ghislieri, C., Molino, M., & Cortese, C. G. (2018). Work and Organizational Psychology Looks at the Fourth Industrial Revolution: How to Support Workers and Organizations? *Frontiers in Psychology*, 9, 2365. <https://doi.org/10.3389/fpsyg.2018.02365>.
- Hargrove, M.B., Quick, J.D.J.C., Nelson, D.L. and Quick, J.D.J.C. (2011). “The theory of preventive stress management: A 33-year review and evaluation”, *Stress and Health*, John Wiley & Sons, Ltd, Vol. 27 No. 3, pp. 182–193.
- Harms-Ringdahl, L., Jansson, T., & Malmén, Y. (2000). Safety, Health and Environment in Small Process Plants – Results from a European Survey. *Journal of Safety Research*, 31(2), 71–80. [https://doi.org/10.1016/S0022-4375\(00\)00026-8](https://doi.org/10.1016/S0022-4375(00)00026-8).
- Hernández, L. G. S., Hogendoorn, E. A., Bakker, J., Broekhuizen, F. A. V., Palmén, N. G. M., en De, Y., et al. (2018). An approach to identify, prioritise and provide regulatory follow-up actions for new or emerging risks of chemicals for workers, consumers and the environment. *International Journal of Risk Assessment and Management*, 21(3), 248. <https://doi.org/10.1504/IJRAM.2018.093763>.
- Irastorza, X., Milczarek, M., & Cockburn, W. (2016). Second European Survey of Enterprises on New and Emerging Risks (ESENER-2) – Overview Report: Managing Safety and Health at Work. 10.2802/0742 (print);10.2802/648652 (pdf).
- Koppenborg, M., Nickel, P., Naber, B., Lungfiel, A., & Huelke, M. (2017). Effects of movement speed and predictability in human-robot collaboration. *Human Factors and Ergonomics in Manufacturing & Service Industries*, 27(4), 197–209. <https://doi.org/10.1002/hfm.v27.4.1002/hfm.20703>.
- Koukoulaki, T. (2014). The impact of lean production on musculoskeletal and psychosocial risks: An examination of sociotechnical trends over 20 years. *Applied Ergonomics*, 45(2), 198–212. <https://doi.org/10.1016/j.APERGO.2013.07.018>.
- Lastovkova, A., Carder, M., Rasmussen, H. M., Sjöberg, L., Groene, G. J. de, Sauni, R., et al. (2017). Burnout syndrome as an occupational disease in the European Union: an exploratory study. *Industrial Health*, 56(2), 160–165. 10.2486/indhealth.2017-0132.
- Leka, S., Jain, A., Zwetsloot, G. M., & Varti. (2008). Psychosocial risk management: the importance and impact of policy level interventions. *Bollettinoadapt.it*. http://www.bollettinoadapt.it/old/files/document/19784primaef_ebook_20.pdf#page=124.
- Lundberg, U. (2005). Stress hormones in health and illness: The roles of work and gender. *Psychoneuroendocrinology*, 30(10), 1017–1021. <https://doi.org/10.1016/j.PSYNEUEN.2005.03.014>.
- Moore, P. V. (2019). “OSH and the future of work: Benefits and risks of artificial intelligence tools in workplaces”, Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), Vol. 11581 LNCS, Springer Verlag, pp. 292–315.
- Magnavita, N. (2018). Obstacles and future prospects: Considerations on health promotion activities for older workers in Europe. *International Journal of Environmental Research and Public Health*, 15(6), 1–14. <https://doi.org/10.3390/ijerph15061096>.
- Magnavita, N., Capitanelli, I., Falvo, R., La Milia, D. I., Borghini, A., Moscato, U., ... Riccardi, W. (2017). Workplace health promotion programs in different areas of Europe. *Epidemiology Biostatistics and Public Health*, 14(2), 1–8. <https://doi.org/10.2427/12439>.
- Milczarek, M., Brun, E., Houtman, I., & Goudswaard, A. (2007). Expert forecast on emerging psychosocial risks related to occupational safety and health. <https://www.narcis.nl/publication/RecordID/oa:tudelft.nl:uuid%3A63f2881b-5a36-426d-bfda-e97b2a6f33ef>.
- Morillas, R. M., Rubio-Romero, J. C., & Fuertes, A. (2013). A comparative analysis of occupational health and safety risk prevention practices in Sweden and Spain. *Journal of Safety Research*, 47, 57–65. <https://doi.org/10.1016/j.jsr.2013.08.005>.
- Nahrgang, J. D., Morgeson, F. P., & Hofmann, D. A. (2011). Safety at work: A meta-analytic investigation of the link between job demands, job resources, burnout, engagement, and safety outcomes. *Journal of Applied Psychology*, 96(1), 71–94. <https://doi.org/10.1037/a0021484>.
- Niskanen, T., Naumanen, P., & Hirvonen, M. L. (2012). An evaluation of EU legislation concerning risk assessment and preventive measures in occupational safety and health. *Elsevier*, 43(5), 829–842.
- Ponce del Castillo, A., & Meinert, S. (2016). Occupation safety and health in 2040: Four scenarios. http://www.stm.fi/c/document_library/get_file?folderId=39503&name=DLFE-7149.pdf.

- Richter, A., & Näswall, K. (2019). Job insecurity and trust: Uncovering a mechanism linking job insecurity to well-being. *Work and Stress*, 33(1), 22–40. <https://doi.org/10.1080/02678373.2018.1461709>.
- Roberts, R. K., Swanson, N. G., & Murphy, L. R. (2004). Discrimination and occupational mental health. *Journal of Mental Health*, 13(2), 129–142. <https://doi.org/10.1080/09638230410001669264>.
- Saksvik, P. Ø., & Quinlan, M. (2003). Regulating Systematic Occupational Health and Safety ManagementLa régulation de la gestion systématique de la santé et de la sécurité au travailRegular la gestión sistemática de la salud y seguridad ocupacional. *Relations Industrielles*, 58(1), 33–59. <https://doi.org/10.7202/007368ar>.
- Schütte, S., Chastang, J. F., Malard, L., Parent-Thirion, A., Vermeylen, G., & Niedhammer, I. (2014). Psychosocial working conditions and psychological well-being among employees in 34 European countries. *International Archives of Occupational and Environmental Health*, 87(8), 897–907. <https://doi.org/10.1007/s00420-014-0930-0>.
- Segarra Cañamares, M., Villena Escribano, B. M., González García, M. N., Romero Barriuso, A., & Rodríguez Sáiz, A. (2017). Occupational risk-prevention diagnosis: A study of construction SMEs in Spain. *Safety Science*, 92, 104–115. <https://doi.org/10.1016/j.ssci.2016.09.016>.
- Spangenberg, S., Baarts, C., Dyreborg, J., Jensen, L., Kines, P., & Mikkelsen, K. L. (2003). Factors contributing to the differences in work related injury rates between Danish and Swedish construction workers. *Safety Science*, 41(6), 517–530. [https://doi.org/10.1016/S0925-7535\(02\)00007-3](https://doi.org/10.1016/S0925-7535(02)00007-3).
- Stacey, N., Ellwood, P., Bradbrook, S., Reynolds, J., Williams, H., & Lye, D. (2018). Foresight on new and emerging occupational safety and health risks associated with digitalisation by 2025. 10.2802/515834.
- Stamatogianni, E., Anyfantis, I. D., Dimopoulos, C., & Boustras, G. (2019). Validating the accuracy of ESENER-II in assessing psychosocial risks for the case of micro firms in Cyprus. *Safety Science*, 120, 783–797. <https://doi.org/10.1016/j.ssci.2019.08.006>.
- Sterud, T., Tynes, T., Mehlum, I. S., Veiersted, K. B., Bergbom, B., Airila, A., Johansson, B., Brendler-Lindqvist, M., Hviid, K., & Flyvholm, M. A. (2018). A systematic review of working conditions and occupational health among immigrants in Europe and Canada. *BMC Public Health*, 18(1), 1–15. 10.1186/s12889-018-5703-3.
- Sundstrup, E., Seeberg, K. G. V., Bengtsen, E., & Andersen, L. L. (2020). A systematic review of workplace interventions to rehabilitate musculoskeletal disorders among employees with physical demanding work. *Journal of Occupational Rehabilitation*, 30(4), 588–612. <https://doi.org/10.1007/s10926-020-09879-x>.
- Targoutzidis, A., Koukoulaki, T., Schmitz-Felten, E., & Kuhl, K. (2014). The business case for safety and health at work: Cost-benefit analyses of interventions in small and medium-sized enterprises. <https://www.narcis.nl/publication/RecordID/oa:tudelft.nl:uuid:50cd2390-09ec-4206-82ca-bca6decf46e1>.
- van den Heuvel, S. G., Bakhuys Roozebom, M. C., Eekhout, I., & Venema, A. (2018). Management of psychosocial risks in European workplaces – evidence from the second European survey of enterprises on new and emerging risks (ESENER-2). 63. 10.2802/5030.
- Vassie, L., Tomàs, J. M., & Oliver, A. (2002). Health and Safety Management in UK and Spanish SMEs. *Journal of Safety Research*, 31(1), 35–43. [https://doi.org/10.1016/S0022-4375\(99\)00028-6](https://doi.org/10.1016/S0022-4375(99)00028-6).
- Vaughan-Jones, H., & Barham, L. (2009). Healthy Work Challenges and Opportunities to 2030. http://www.unionsafety.eu/pdf_files/HealthyWorkChallenges2030.pdf.
- Verra, S. E., Benzerga, A., Jiao, B., & Ruggeri, K. (2019). Health promotion at work: A comparison of policy and practice across Europe. *Safety and Health at Work*, 10(1), 21–29. <https://doi.org/10.1016/j.shaw.2018.07.003>.
- Juan Carlos Aldasoro** has a Degree in Sociology and a PhD in Business Management from the University of The Basque Country UPV-EHU. He is a lecturer at the Faculty of Engineering, Gipuzkoa. **Recent publication:** Cantonnet, M. L., Aldasoro, J. C., & Iradi, J. (2019). New and emerging risks management in small and medium-sized Spanish enterprises. *Safety science*, 113, 257–263. **Research interest areas:** occupational health, safety and health at work, management systems.
- María Luisa Cantonnet** has a Degree in Law and a PhD in Business Management from the University of The Basque Country UPV-EHU. She is a lecturer at the Faculty of Engineering, Gipuzkoa. **Recent publication:** Cantonnet, M. L., Aldasoro, J. C., & Iradi, J. (2019). New and emerging risks management in small and medium-sized Spanish enterprises. *Safety science*, 113, 257–263. **Research interest areas:** occupational health, safety and health at work, management systems