



Work-Related Musculoskeletal Disorders (WMSDs) and Mental Health

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Abstract

Objective: Work-related Musculoskeletal Disorders (WMSDs) represent a major concern for the suffering and medical attention they entail, and social and economic impact. The objective of this study was to evaluate the association between work-related musculoskeletal disorders and psychiatric disturbance.

Method: The participants, female workers at an electrical components factory for the automotive industry (N=145), having been evaluated by the Screening Questionnaire for Work-related Musculoskeletal Disorders (QR-LMERT), Body diagram of Corlett & Manenica and the Mental health screening scale-ER80.

Results: Among those inquired, 35, 9% referred signs and symptoms of WMSDs and 9, 7% had psychiatric history, resulting in a very significant association between both entities; were registered 19, 2% cases of psychiatric morbidity among the 52 workers with WMSDs in comparison to 4, 3% of psychiatric morbidity among the 93 individuals without WMSDs.

Conclusions: A statistically significant association between the psychiatric cases and the WMSDs was established. Although 81% of the WMSDs cases had no accompanying psychiatric comorbidities, the 19% of cases in which this association is found are those with the greatest intensity of pain/discomfort.

Introduction

Work-related Musculoskeletal Disorders (WMSDs) and mental health

Work-related Musculoskeletal Disorders (WMSDs) represent a wide range of inflammatory and degenerative disorders that affect muscles, tendons, joints, peripheral nerves and blood vessels, developing as a result of the cumulative action of repeated injuries and/or muscle tension secondary to more or less in-

tense and repeated movement efforts during the work period. These “chronic pain syndromes (that) occur in the course of a given professional activity” as a result of the “action of risk factors such as repetitive work, overloading and/or body postures adopted at work” (p.9 e 11) [1]. The most affected body parts are usually the upper limbs, neck, back and lower limbs, its incidence depending on the activity performed and the risks exposed [1-4].



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Although it isn't a recent problem, this type of disorder was first mentioned more than 200 years back by Ramazzini (1731), an Italian doctor, describing symptoms of muscle fatigue and loss of strength in the hand related to the work of writing it was only in the last decades of the century that it began to acquire greater importance as a public health problem, with a strong social and economical impact [3,5,6]. In the European Union (EU), the WMSDs represent 53% of the total number of occupational disorder recorded, and it is estimated that the cost of lost productivity among people of working age could be as high as 2% of Gross Domestic Product (GDP) [7]. In the United States, for the year of 2014, workplace overexertion injuries are estimated to cost \$15.1 billion a year and account for about 25% of the total worker's compensation cost [5]. Behind this explosive increase of WMSDs is the deployment of new technologies and equipment (automation and information) and forms of work organization (repetitiveness, monotony, speed of execution, rhythm imposed by the machine, insufficient recovery times, awkward postures, static overload of muscle segments) that make us witness in the current development cycle, the emergence of illnesses related to work overload [2,8-10].

Regarding WMSDs, two issues must be considered. WMSDs represent a wide range of disorders, which can vary from mild to severe, chronic and debilitating. Some musculoskeletal disorders have specific diagnostic criteria and clear pathological mechanisms (e.g. hand-arm vibration syndrome, carpal tunnel) while others are defined primarily by the location of the pain and have a more variable or less defined pathophysiology (e.g. back pain, feeling of numbness or tingling). Secondly, disorders are multifactorial, and both occupational as well as non-occupational factors contribute to their development and exacerbation. As noted in a WHO report, work-related disorders may be caused, aggravated, accelerated or intensified by exposure to the working environment and impair the ability to work, but personal characteristics and other sociocultural and environmental factors also play a role as risk factors [11]. There is however unquestionable evidence of the association between the onset and course of musculoskeletal disorders and the exposure to occupational physical stressors, the imbalance between the demands of work and the capabilities of the individual and the insufficient recovery time, and the influence of preventive interventions in the workplace for the prevention of these disorders or mitigation of their pathological consequences [1,4,11-13].

Another issue that cannot be dissociated from conditions and work organization is mental health. Studies conducted in recent decades show that the number of workers affected by mental illness is increasing, as well the exposure to psychosocial and emotional risks [14,15]. A person is a complex, integrated and global system, so that physical and mental suffering are two components of the same dimension, the loss of health. Taking that into account, the purpose of this study was to evaluate the association between WMSDs and mental disorder, hypothesize that there is an important association. This information is relevant for the understanding of suffering and the implementation of appropriate strategies for the development of the best working environment and the promotion of mental health at work.

Materials and methods

Study sample

The sample surveyed was a group of Portuguese workers from an electrical components for the automotive industry

(window regulators) factory. The study was preceded by its presentation to the factory's administration that subsequently authorized its undertaking and was approved by the ethics committee of the local health unit of alto minho (ULSAM).

Procedure

It was a cross-sectional descriptive study. The questionnaires were distributed during working hours, with the collaboration of health and safety technicians of the company, and collected at the end of the work period.

Instrumentation

In addition to a short questionnaire to record sociodemographic data (gender, age, level of education, professional activity, age at first employment, current work with or without shifts), three instruments were used:

Screening Questionnaire for Work-related Musculoskeletal Disorders (QR-LMERT): Developed by Herval Ribeiro, [16] is a brief questionnaire, self-assessing, which can be completed in the workplace, in rapid surveys to determine the cases indicative of WMSDs. Consisting of eight questions, dichotomous responses (Yes/No), covers symptoms reported to the muscles and joints of the neck, shoulders, arms, hands and fingers, inquiring about the presence of: feelings of discomfort, fatigue or heaviness (item 1); pins and needles (item 2), loss of tactile or painful sensitivity (item 3), pain on pressure or movement (item 4), swelling (item 5), difficulty in performing movements of extension, flexion or rotation (item 6). The last two questions evaluated if the symptoms improved or disappeared on weekends, holidays or when not at work (item 7), and if the duration of any two of the symptoms was longer than 30 days (item 8). It was considered suggestive of WMSDs when positive responses were given to item 8 and one of items 1-6. The sum of positive responses to items 1-6 provides an index of pain/discomfort related to WMSDs. The questionnaire utilized was applied to the Portuguese population showing good internal consistency (Cronbach's alpha = 0,75) and convergent validity [17].

Body diagram of Corlett & Manenica (1980) [18]: Diagram representing a back-facing human body, divided into 24 segments to facilitate identification of painful areas. The person questioned is requested to indicate for each of these areas the degree of discomfort on a scale from 1 ("no discomfort or pain") to 5 ("intolerable discomfort or pain"). In addition to the score assigned to each area, it was considered in the present work the sum of the scores awarded by region: trunk, upper limbs and lower limbs.

ER80 (Pio de Abreu & Vaz Pato, 1981): Scale of psychiatric morbidity with 16 self-assessment questions adapted to the Portuguese population. The items are scored inversely meaning that the lower the score the better the mental health. A score above the threshold as defined by the authors of the instrument (men ≥ 6 ; women ≥ 7) allows the identification of the existence of psychiatric illness ("*psychiatric case*") [19]. The questionnaire has been widely used in clinical populations such as hospitals and in primary health care, as well as immigrants and industrial workers, with good internal consistency and discriminative indices [20,21].

Statistical analysis

In the descriptive analysis of numerical and categorical variables we used nonparametric tests (chi-square test and Mann-Whitney μ) for comparison between groups, considering a sig-

nificance level of 5% ($p < 0.05$), with two-tailed distribution. The statistical evaluation was conducted with the statistical analysis software IBM SPSS Statistics 21.0.

Results

Subjects who participated in this study consisted of 145 females belonging to the production sector of the factory unit. On average, the age of sample was 39.6 (SD= 8.867) years, with 8.9 (SD= 2.861) years of schooling and 21.1 years (SD= 9.534) of work since the beginning of the first job. Almost all of the subjects did shift work (95.9%) but only 51.7% reported doing “microbreaks” for restoring their physical condition to work (Table 1).

Table 1: General characteristics of the sample.

N°	145
Age (years): mean (SD)	39.6 (8.867)
limit	20-58
Education (years completed): mean (SD)	8.9 (2.861)
Age of first job: mean (SD)	18.5 (5.255)
Time (years) professional activity: mean (SD)	21.1 (9.534)
Actual Job	
swift work [1]: (yes) %	95.9%
small breaks [2]: (yes)%	51.7%
[1] 3 (2.1%) didn't participate [2] 12 (8.3%) didn't participate	

Table 2 presents the results of the Screening Questionnaire for Work-related Musculoskeletal Disorders (QR-LMERT) and ER-80. Among the 145 respondents, 52 (35.9%) had significant symptoms of WMSDs. In turn, 14 (9.7%) indicated mental disorders in the responses to psychiatric morbidity (ER-80). Both the distribution of cases of WMSDs and the psychiatric cases do not appear influenced by the age of the sample.

Table 2: Work-related Musculoskeletal Disorders (QR-LMERT) and Psychiatric Morbidity (ER-80).

	WMSDs (QR-LMERT)		Psychiatric Morbidity	
	Absent	Presence	Absent	Presence
N° (%)	93 (64.1)	52 (35.9)	131 (90.3)	14 (9.7)
Age: N (%)				
20-29 years	14 (9.7)	4 (2.8)	16 (11.0)	2 (1.4)
30-39 years	34 (23.4)	21 (14.5)	51 (35.2)	4 (2.8)
40-49 years	31 (21.4)	14 (9.7)	39 (26.9)	6 (4.1)
50-59 years	14 (9.7)	13 (9.0)	25 (17.2)	2 (1.4)
	$\chi^2 = 3.798$ (gl= 3) NS		$\chi^2 = 1.256$ (gl= 3) NS	

Regarding the association between WMSDs and mental disorder this is statistically significant ($p < 0.01$) with 10 cases of psychiatric morbidity among the 52 who suffer from WMSDs in contrast to four cases of mental disorder among the 93 subjects without signs or symptoms of WMSDs (Table 3).

Table 3: Association WMSDs and Psychiatric Morbidity (ER-80).

	Without WMSDs 93 (64.1%)	With WMSDs 52 (35.9%)
Mental disorder:		
Absent	89 (95.7%)	42 (80.8%)
Presence	4 (4.3%)	10 (19.2%)
$\chi^2 = 8.522$ (gl= 1) $p < 0.01$		

Taking as reference the intensity of the signs and symptoms of the WMSDs presented by these respondents, measured by the index of the *Screening Questionnaire for Work-related Musculoskeletal Disorders* (QR-LMERT), they are significantly more intense among individuals with mental disorder than without ($p < 0.001$) and the difference remains statistically significant as a function of the three regions defined in the Corlett and Manenica diagram: trunk ($p < 0.01$), upper ($p < 0.001$) and lower limbs ($p < 0.001$).

Table 4: Intensity of pain or discomfort of the WMSDs (QR-LMERT) and psychiatric morbidity.

	Psychiatric morbidity (ER-80)		μ Mann-Whitney Test
	Absent (n°=131) Mean (SD)	Presence (N°= 14) Mean (SD)	
WMSD (QR-LMERT)			
Perception of pain/discomfort:			
Trunk	13.5 (6.339)	18.7 (5.539)	478.5 $p < 0.01$
Upper limb	23.8 (10.092)	33.8 (9.537)	422.5 $p < 0.001$
Lower limbs	17.8 (8.009)	26.0 (8.385)	408.0 $p < 0.001$

Discussion

The first point to retain from this study is that the sample is an active population, labor-time reporting, which implies that they are healthy people or at least functionally able to perform their functions.

The second point is the percentage of subjects who have symptoms suggestive of WMSDs (35, 9%). In a 1996 study by the Foundation for the Improvement of Living and Working Conditions (EUROFOUND), Portugal was the country from the 15 member countries of the European Union that had the highest prevalence of workers to refer back pain (39%) and pain of the upper and lower limbs (31%) [22]. Other studies, more recent, also point to high levels of WMSDs, particularly in the automotive industry (60% with WMSDs and 97.1% of workers affected at the level of the upper limbs), [23,24] furniture industry (80% of workers with pain/discomfort) [25] and professional sectors in healthcare services, such as nurses (81% of musculoskeletal symptoms in the last 12 months) [26] and dentists (76.7% of pain/discomfort) [27]. With a very different methodology, Miranda et al., [3] had surveys sent to physicians working in 515 companies, with a total of 410 496 workers, representative of 11% of the working Portuguese population, establishing that WMSDs affected 5.9 percent (24 269) of national workers.

Another factor to consider is the presence of 7.6% of probable psychiatric cases in this sample and how these cases are related to the presence of more pain/discomfort in WMSDs. Cross-sectional studies and correlation, by their nature do not

allow defining relations of causality or temporal sequence, so that three types of hypotheses can be accepted: a) the work conditions and organization promoting musculoskeletal disorders together with the difficulties inherent in functioning and well-being of the person with the fear of loss of production and fear of being away from work, bring with them an increase in emotional disturbances and mental dysfunction, b) people with psychological morbidity by their fragility are more vulnerable to suffer from WMSDs and perceive more intensely the signs and symptoms of WMSDs; c) WMSDs and mental distress are independent entities that coexist and both may result from other factor(s) or any combination thereof, these being factors related to work and/or with the subject.

The nature of the relationships underlying the association between WMSDs and psychiatric morbidity is complex so it can't be simplified without risking misassumptions, but one point emerges as a conclusion of this study: the highest intensity of pain/discomfort among workers is associated with psychiatric morbidity.

Studies about prevalence of multimorbidity vary widely, making comparison difficult because depend on the types of diseases included, definition of multimorbidity, population and methodology but, in general, they point to musculoskeletal disorders and mental disorders as causing the greatest social burden, strongly related to work productivity loss [15,28,29], however studies that focus on the worker himself and his suffering are lacking.

According to a study published in the 6th European Working Conditions Survey (Eurofound, 2016) [30], 6% of workers in the EU28 have a score in the WHO-5 Wellbeing Index that indicates they are at risk of mental health problems, with more women than men being at risk (7% compared to 5%), without differences between age groups, but with differences across sectors and occupations, with a greater proportion of workers in primary occupations at risk (9%). Many other studies corroborate the impact of the psychosocial risks of work on mental health with high repercussions at the level of individuals, organizations and society [31] and, although people with severe mental disorder are often away from work [32], those who remain are at a greater risk of worsening of symptoms, increased work absenteeism or presentism with productivity losses and accidents at work, and unemployment [32,33].

Regarding musculoskeletal complaints and mental disorders (such as burnout, depression, anxiety, somatization), Westgaard and Winkel did an extensive review on the rationalization of the production system on the health of the worker, noting that they share symptoms and that it is difficult to differentiate between the two diagnostic categories based solely on self-assessment, hence treating them as entity [34]. Musculoskeletal and mental disorders are however not only "intertwined as a medical condition" (p. 266) [34] but, as observed in the present study, they correlate positively in regard to the intensity and severity of complaints.

A third factor to take into account is the role of work psychosocial risk factors (interpersonal stress at work, inadequate breaks, job control, support from others when at work, job satisfaction, long hours at work and repetitive work, high job demands, low control/influence, lack of social support) in the development of musculoskeletal disorders. Due to poor working conditions, directly related to the organization, content of the work and accomplishment of the task, work psychosocial

risk factors affect both work development and worker health, with strong evidence of its association with WMSDs [12,35]. The consideration of these factors demonstrated that not only heavy physical workers but also light physical workers, with low biomechanical exposure, can express high frequency of work-related musculoskeletal symptoms [9,36].

Giving testimony of suffering through the answers to a self-assessment questionnaire also refers to the questions of the forces that construct that suffering. No response could be singular, however, the rationality of the answers, noting the comorbidity between work related musculoskeletal disorders and mental disorders, show that they both share the same condition, that is, in Veena Das's description, "do not lie outside the horizon of the everyday-buried in the everyday they constitutes its eventedness" (p. 102) [37]. On the other hand, in today's fluid and changeable society, it is important to understand the repercussions that these problems have on the individuals involved in the double role of workers and constructors of an "identity" [38].

Christophe Dejours brought to the field of psychodynamic work the notion of suffering, with the double concept of starting point (creative suffering) and point of arrival (suffering pathogenic) [39,40]. The destructive experience of work, where the body experiences the feeling of impotence and incapacity, is amplified when to the failure somatic resistance (musculoskeletal) is added that of mental failure. This progression involves considering the working person as a whole, for whom work is a space for the construction of identity, continuity and historicity. The emergence of pathogenic suffering means a state of struggle, of resistance against the forces that lead to disease. In order for the obstacles to be overcome and health restored (and the feeling of distress reversed towards that of achievement) it needs to be considered more than the individual worker, also the organization of work, as it is part of the latter, in every instance, the role of mediator for the elements of health that comprise it.

A strength of this study is the demonstration of ease of use and construct validity of the *Screening Questionnaire for Work-related Musculoskeletal Disorders* developed by Herval Ribeiro. Some limitations of this study should be mentioned. First, the instruments used are not clinical diagnostic procedures but self-assessment screening instruments to identify probable cases of WMSDs and mental disorders. Second, the self-reported data might be subject to a negative opinion for work and mental health and this bias cannot away. Third, as cross-sectional study design it was not possible to investigate causal relationships between WMSDs and mental disorders but just analyse the association that may exist between variables (correlations). Four, future research should focus on specific diagnoses and assess the repercussions of WMSDs suffering on workers' mental health.

Conclusion

In conclusion, work-related musculoskeletal disorders, evaluated through a screening questionnaire (QR-LMERT), had a higher prevalence in the surveyed sample of Portuguese workers, and showed strong statistically significant association with the psychiatric cases. Although about 81% of the WMSDs cases had no accompanying psychiatric comorbidities, those 19% of cases where that association was found presented the highest intensity of pain/discomfort.

This association between occupational musculoskeletal and

mental disorders points to the need for holistic interventions at the organizational level in order to prevent exposure to risk factors and reduce negative impacts on the well-being of workers and promotion of healthy work conditions.

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