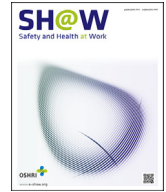




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Original Article

Musculoskeletal Disorders Among Greek Physiotherapists: Traditional and Emerging Risk Factors



I.D. Anyfantis*, A. Biska

Center for the Prevention of Occupational Hazards of Central Greece, Labour Inspectorate (SEPE), Greek Ministry of Labour, Larissa, Greece

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ABSTRACT

Background: Musculoskeletal disorders (MSDs) in the health industry are quite common, however, there have only been a few studies regarding physiotherapists, while in Greece, there is an apparent lack of research and data. The aim of this study is to investigate MSDs experienced by physiotherapists in Greece, their causes and specific measures, and good practices followed. Additional emerging risk factors will be examined.

Methods: A questionnaire of MSDs followed by individual and workplace characteristics was completed by 252 physiotherapists. It covered the major workplace categories such as public hospitals, private rehabilitation centers, and private practices.

Results: Analysis indicated that 89% of the respondents had experienced a work-related MSD; 32.2% of those injuries occurred within the first 5 years of working. The most lumbered physiotherapists were those working as private practitioners and almost half of the injured respondents chose to work while injured. The most common measure taken to tackle work related MSDs was found to be physical therapy sessions. Job satisfaction and psychosocial issues were also identified as side-effects of the economic slowdown.

Conclusion: Physiotherapists in Greece were found to suffer from MSDs; workplace musculoskeletal injuries were quite common but under-reported. The body parts most affected were the lower back, the upper back, the shoulders, and the neck. There was a strong correlation between the workplace setting and the number of MSDs. A well-defined occupational safety and health management system and strict administration steering were found to reduce MSDs. The economic slowdown experienced in Greece during the execution of this study placed additional pressure on physiotherapists.

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1. Introduction

Musculoskeletal disorders (MSDs) are among the most common work-related complaints. Throughout Europe, they affect millions of workers and cost employers billions of euros. Dealing with MSDs improves quality of life and increases productivity. One of the most common practices is having physiotherapy sessions by specialized physiotherapists. Even though there has been quite extensive research on the consequences of MSDs, the importance of tackling them, and possible interventions, there is an apparent research gap in examining the MSDs experienced by physiotherapists themselves. There is quite extensive literature available about MSDs in

the healthcare sector but little available data specifically for the profession of physiotherapists, while no similar study has ever been performed in Greece.

However, there are some apparent difficulties in performing such research. It has been reported that physiotherapists tend not to report their injuries through the workers' compensation system [1–3]. Moreover, a large number of those are working in a private practice, underestimating their own risk factors. In that sense, official statistics do not give a clear picture of occupational injury in physiotherapists [4].

Previous research has identified high incidence rates of MSDs in physiotherapists. For instance, Cromie et al. [1] performed a survey

* Corresponding author. Center for the Prevention of Occupational Hazards of Central Greece, Labour Inspectorate (SEPE), Greek Ministry of Labour, Farsalon 6, 41110, Larissa, Greece.

E-mail address: yiannis4@gmail.com (I.D. Anyfantis).

among physiotherapists in the state of Victoria, Australia, and found that work-related pain or discomfort had been experienced by 91% of respondents, while Bork et al. [5] identified an incidence of 61% of work-related MSDs among physical therapy graduates from the University of Iowa, USA.

Furthermore, they identified that the most prevalent injuries were those of the lower back [6]. Other research has identified commonly injured areas such as wrists, hands, upper back, and neck [1,5]. Mierzejewski and Kumar [2] found that 49.2% of physical therapists in Canada reported work-related lower back pain. Scholey and Hair [7] performed a survey in Britain and reported 57% of continual back pain and 38% of a "last 12 month" prevalence of back pain. Molumphy et al. [3] found 29% of respondents in California, USA reporting work-related lower back pain. Additionally, Rozenfeld et al. [8] found the prevalence of neck and shoulder disorders in physiotherapists to be 45.5%, even though physiotherapists are considered to have a low prevalence of upper limb MSDs compared to other groups of healthcare workers [9].

Most work-related MSDs develop over time. Usually, there is no single cause of MSDs; but various factors work in combination. According to the European Agency for Safety and Health at Work (EU-Occupational Safety and Health Agency (EU-OSHA)), the most common physical causes and organizational risk factors of MSDs include:

- Load handling, especially when bending and twisting
- Repetitive or forceful movements
- Awkward and static postures
- Vibration, poor lighting, or cold working environments
- Fast-paced work
- Prolonged sitting or standing in the same position

Thus, the use of manual therapy techniques such as massage was associated with wrist and hand symptoms [1,5]. Age is also considered to be a factor. Bork et al. [5] found that older respondents (over 50 years old) had the lowest rate of work-related injuries. Mierzejewski and Kumar [2], Molumphy et al. [3], and Scholey and Hair [7] found that most respondents' symptoms appeared before the age of 30 and within 5 years of graduation.

This study aims to investigate MSDs and factors associated with such injuries among Greek physiotherapists and identify specific measures and good practices.

2. Materials and methods

The study was conducted in the second half of 2015 in the regions of central and northern Greece. It covered all working categories such as public hospitals (32.9%), private rehabilitation centers (37.7%), and private practices (29.4%).

2.1. Questionnaire

In order to gather valid data and to overcome issues like the under-reporting of MSDs, a self-administered questionnaire was created. The questionnaire was divided into seven main sections, covering topics such as: (1) rate of musculoskeletal injuries and body areas that suffer more; (2) correlation of musculoskeletal injuries and work-years/workplace/working hours/physical therapy acts/sex; (3) correlation of musculoskeletal injuries and use of special work equipment; (4) other risk factors; and (5) measures taken to minimize the risk and confront MSDs.

In total, 320 questionnaires were distributed to physiotherapists for completion. The required authorizations were granted by public hospitals in order to participate in the research. There were 252 responses, giving a response rate of 79%. There were 83 responses

Table 1
Strain for different body areas

Body part	Strain					Body area chosen as major injury
	No (1) n = 252	Little (2) n = 252	Fair (3) n = 252	Very (4) n = 252	Most (5) n = 252	
Neck	36 (14%)	56 (22%)	64 (25%)	48 (19%)	48 (19%)	10%
Upper back	20 (8%)	40 (16%)	52 (21%)	76 (30%)	64 (25%)	19%
Lower back	12 (5%)	4 (2%)	44 (17%)	68 (27%)	124 (49%)	38%
Shoulders	20 (8%)	48 (19%)	64 (25%)	44 (17%)	76 (30%)	12%
Elbows	52 (21%)	60 (24%)	56 (22%)	48 (19%)	36 (14%)	1%
Wrists	44 (17%)	40 (16%)	44 (17%)	60 (24%)	64 (25%)	9%
Fingers	56 (22%)	48 (19%)	48 (19%)	40 (16%)	60 (24%)	4%
Hips	48 (19%)	60 (24%)	64 (25%)	32 (13%)	48 (19%)	1%
Knees	36 (14%)	40 (16%)	76 (30%)	52 (21%)	48 (19%)	6%
Legs	60 (24%)	76 (30%)	44 (17%)	32 (13%)	40 (16%)	0%
Toes	96 (38%)	76 (30%)	32 (13%)	20 (8%)	28 (11%)	0

from physiotherapists working in public hospitals, 96 in private rehabilitation centers, and 73 working as private practitioners. Quantitative analysis and qualitative analysis of the questionnaires were performed in order to extract the results.

2.2. Statistical analysis

Continuous variables are presented as mean (\pm standard deviation) and categorical variables, as absolute (n) and relative (%) frequencies. Associations between categorical variables were explored by the use of the Chi-square test. Continuous variables were tested for normal distribution by the Kolmogorov-Smirnov test. Univariate analysis of normally distributed continuous variables was performed by the Student *t* test. The Mann-Whitney test was used to compare variables that did not follow normal distribution. Spearman rank-order correlation coefficient ρ was used to test the strength and direction of association that exists for ordinal variables while analysis of variance was used to compare more than three groups. Statistical analysis was performed using SPSS for Windows version 20.0 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp). A two-tailed *p* value < 0.05 was considered statistically significant.

3. Results

Out of the 252 respondents, 132 (52.4%) were men and 120 (47.6%) were women. The average age of the target group was 42.18 (\pm 9.214) years old.

3.1. Prevalence of musculoskeletal injuries in physiotherapists in Greece and the main body areas that suffer more

Table 1 presents the extent of musculoskeletal injuries experienced by physiotherapists that participated in our study. A Likert scale was used, starting from "no strain" up to "most strain". Some 89% of the respondents experienced a work-related musculoskeletal injury. A pseudo-variable called suffer score index was calculated by determining the sum of the Likert answers for each body part affected for each respondent. In Tables 1 and 2 it can be seen that most complaints and strain refer to the lower back, upper back, shoulders, wrist, knees, and fingers.

Table 2
Suffer score per body part

Body part	Suffer score	Median (\pm SD)	r (s)	p^*
Neck	520/1260	3 (\pm 1.344)	0.272	0.011
Upper back	628/1260	3 (\pm 1.325)	0.217	0.045
Lower back	792/1260	4.5 (\pm 1.128)	0.037	0.012
Shoulders	612/1260	3 (\pm 1.378)	0.229	0.034
Elbows	460/1260	2 (\pm 1.411)	0.201	0.068
Wrists	546/1260	3 (\pm 1.507)	0.293	0.007
Fingers	504/1260	3 (\pm 1.528)	0.337	0.002
Hips	476/1260	3 (\pm 1.403)	0.148	0.175
Knees	540/1260	3 (\pm 1.310)	0.081	0.461
Legs	420/1260	2 (\pm 1.409)	0.123	0.266
Toes	312/1260	2 (\pm 1.359)	0.291	0.007

* Spearman correlation.

Suffer score, Sum of answers. Strain: No = 1, Most = 5.
SD, standard deviation.

Accordingly, the body areas chosen as the most lumbered were the lower back (38%), upper back (19%), shoulders (12%), neck (10%), and wrists (9%).

3.2. Correlation of musculoskeletal injuries in physiotherapists and years of work as a physiotherapist/sex/working hours/workplace/acts

In order to access correlation of MSDs and each one of the above parameters, the score index pseudo-variable was used.

3.2.1. Musculoskeletal injuries in physiotherapists and work-years

Analysis of variance was used to determine the relationship between MSDs (suffer score index) and years of work. A strong positive correlation was found between them (Table 3).

According to Table 2, it can be seen that musculoskeletal injuries in physiotherapists seem to have an ascending trend related to the years of work. A major change of this trend seems to take place for those working for more than 15 years as physiotherapists. Also, approximately 32.2% of those injuries occurred within the first 5 years of working as physiotherapists.

3.2.2. Musculoskeletal injury and sex/working hours/acts

Statistical analysis (Spearman's rank-order correlation) revealed that there is no significant difference in suffer score index between men and women, even though men have been identified to work more and experience more working hours in a standing position (Table 4).

Additional statistical analysis showed that there is an apparent correlation of sex and musculoskeletal injuries when certain acts such as massage are performed ($p = 0.017$).

Table 3
Correlation, between work-years and musculoskeletal disorders (MSDs)

Duration of employment (work y)	Total strain MSDs suffer score (mean \pm SD)	Standard error	95% confidence interval for mean		p^*
			Lower bound	Upper bound	
<5 $n = 96$	29.82 \pm 10.355	1.802	26.15	33.49	0.004
5–10 $n = 77$	28.81 \pm 11.741	2.26	24.17	33.46	
10–15 $n = 35$	42.83 \pm 13.604	3.927	34.19	51.48	
>15 $n = 44$	33.00 \pm 10.71	2.785	29.28	34.42	

* Analysis of variance (ANOVA) was used.
SD, standard deviation.

Table 4
Correlation, between work-years and body part affected by musculoskeletal disorders (MSDs)

	Men $n = 110$	Women $n = 142$	p^*
MSDs suffer score (mean \pm SD)	30.80 (\pm 11.228)	32.74 (\pm 12.778)	0.551
Working h	9.32 (\pm 1.783)	7.44 (\pm 0.921)	0.001
Working h in a standing position	7.87 (\pm 1.584)	6.71 (\pm 1.023)	0.008

* Spearman's rank-order correlation.

SD, standard deviation.

3.3. Musculoskeletal injury and workplace

It was found that there is an apparent correlation between musculoskeletal injuries and the workplace. Physiotherapists working as private practitioners gather the higher suffer score index, followed by those working in public hospitals (Table 5).

3.4. Correlation of musculoskeletal injuries in physiotherapists and the use of special work equipment

While moving or lifting patients, there was only rare use of special equipment, and this decreased in cases of overweight patients.

The statistical analysis revealed that there was a strong correlation between the workplace and the use of special work equipment ($p < 0.001$). When special work equipment was used, it was mainly performed in large private rehabilitation centers (Table 6).

It was found that motorized and adjustable hospital beds are mainly used by physiotherapists in private rehabilitation centers. However, this was not a common case for those working in public hospitals or as private practitioners.

Ergonomically designed chairs for physiotherapists themselves were not used on a regular basis. Additionally, a strong correlation was found between their use and the workplace as well as the working years ($p = 0.017$).

3.5. Determining other risk factors

A number of other risk factors were identified by analyzing the questionnaire.

Those factors are summarized in Table 7.

Additionally, 47% of injured respondents chose to work while injured and not to take a long time off for recovery. Some 32% of the respondents reported a desire for a career change. Psychosocial issues were also found to play a key role, amplified by the effects of the economic slowdown.

Table 5
Musculoskeletal injury and workplace

Workplace	MSDs suffer score (mean \pm SD)	Standard error	95% confidence interval for mean		p^*
			Lower bound	Upper bound	
Private practice $n = 73$	31.83 (\pm 7.09)	1.671	28.31	35.36	0.028
Public hospitals $n = 83$	36.38 (\pm 13.86)	2.43	31.40	41.36	
Private rehabilitation centers $n = 96$	28.58 (\pm 12.233)	1.934	24.66	32.49	

* Analysis of variance (ANOVA) was used.
SD, standard deviation.

Table 6
Use of special equipment

Equipment use	Private practice median (\pm SD) n = 73	Hospitals median (\pm SD) n = 83	Private rehabilitation centers median (\pm SD) n = 96	p*
Use of equipment for moving patients	4.5 (\pm 1.41)	5 (\pm 0.783)	3 (\pm 1.312)	<0.001
Use of equipment for rising patients	4.5 (\pm 1.311)	5 (\pm 0.186)	3 (\pm 1.250)	<0.001
Use of motorized and adjustable hospital beds	2 (\pm 1.195)	2 (\pm 1.116)	1 (\pm 0.712)	0.009
Use of ergonomic chairs	3 (\pm 1.249)	3 (\pm 1.391)	3 (\pm 1.207)	0.016

* Analysis of variance (ANOVA) was used.

The Likert scale used was: 1 = always, 2 = many times, 3 = sometimes, 4 = rarely, 5 = never.

SD, standard deviation.

Table 7
Other risk factors as perceived by physiotherapists

Job risk factors	% Of respondents who identified the risk factor
Performing the same task over and over	90
Adopting awkward body positions	70
Abrupt responses	35
Posing significant forces	30
Psychosocial issues	60
Working environment	15
Anthropometric characteristic	10

Table 8
Measures to minimize risk of musculoskeletal disorders (MSDs)

Measure taken by physiotherapists to minimize risk of MSDs	%
Physical therapy sessions	33
Improve their body position - ergonomic stances	25
Use of special work equipment (suitable for each patient)	15
Lifting and stabilizing weight techniques	12
Gymnastics - physical condition - isometric exercises - stretching	10
Number of breaks - resting time	3
Use of personal protective equipment (e.g., pericarp, belt)	2

3.6. Determining measures taken to minimize the risk and confront MSDs

There were a number of suggestions made by respondents regarding measures taken to minimize the risk of MSDs. These measures are presented in Table 8.

4. Discussion

Analysis of the data gathered through this research revealed that Greek physiotherapists suffer an upsetting rate of MSDs and injuries caused by their work. Most injuries were found to be related to the lower back, since all of the upper body's weight bears

down on the lumbar vertebrae, followed by the upper back and the cervical vertebrae which are the thinnest and most delicate vertebrae in the spine.

The lower back was mostly overworked, since the lumbar vertebrae are larger and stronger than thoracic vertebrae, and also more flexible due to the lack of ribs in the lumbar region. All of the upper body's weight bears down on the lumbar vertebrae, leading to many back problems in this region despite the size and strength of the vertebrae.

The frequency and severity of MSDs seem to rise abruptly during the first 5 years of work. This could be caused by the apparent lack of experience and additional training is required to address this issue [10]. More experienced physiotherapists were found to suffer less due to the adoption of good work practices and appropriate work equipment. This finding is in line with previous research that has also identified that inexperience exposes manual therapists to a higher risk of developing injuries such as thumb pain [11].

Even though male physiotherapists worked more and endured long working hours in a standing position, they seem to suffer less from MSDs than female physiotherapists. This finding is in line with previous studies and is probably due to the differences in the nature of the female body versus the male body, since a number of physiotherapy acts require additional physical strength [6,12]. Actually, the anthropometric features of physiotherapists, such as sex, age, weight, height, body type, elasticity, and masculine power were found to be related to injuries, which is also in line with previous research [6].

The study revealed that fewer injuries were suffered by those working in private rehabilitation centers. This could be the case, due to the fact that private rehabilitation centers usually offer better working conditions and certified/specialized equipment. Additionally, it was found that specialized work equipment is mostly used by older and more experienced physiotherapists working in private rehabilitation centers.

Such private rehabilitation centers are usually large enterprises, implementing a well-defined occupational safety and health (OSH) management system. They are inspected on a regular basis by OSH labor inspectors, while they usually adopt international standardization processes (e.g., International Organization for Standardization (ISO)). The Greek Labour Inspectorate (SEPE) holds a central role in maintaining OSH level, especially in periods of economic slowdown [13]. Managers have to address inspectors' comments in order to avoid sanctions. Private practitioners work, in most cases, in small offices; thus, it is more difficult for them to be found and inspected or advised by labor inspectors, except in cases where a special campaign is running. Additionally, there are a great number of private practitioners who do not fall into the scope of the National Labour Inspectorate, since they usually work alone and are not employers of any kind.

Finally, public hospitals are not expedient to inspections, since administrative fines do not apply for them according to national legislation. The only sanction posed to a public hospital would be an administrative report, however this is rare and usually not the case, having questionable results.

Musculoskeletal injuries in physiotherapists were mainly caused by work practices, procedures, by the workplace, and other special characteristics. During physical therapy acts, the vast majority reported to perform the same task over and over, causing injuries of the spine, upper and lower back, and the upper and lower extremities. Moreover, they reported the frequent adoption of awkward body positions that are laborious and tiresome. For example, protracted standing positions, working in the same position for long periods (e.g., standing, bending over, sitting, kneeling), working in "unnatural" static postures in which flexion and/or rotation of the spine and neck are greater than 20 degrees,

etc. These issues have previously been identified and addressed in guidelines for “good practices”; however, they are usually not given the appropriate attention [14].

Additionally, patients’ instability during their treatment, especially during their efforts to stand and walk, their unpredictable movements, and the possibility of them falling, was found to lead to abrupt responses of physiotherapists, posing pressure to muscles and bones, especially to the spine. Practicing massage and the use of heavy and bulky equipment during physical therapy acts pose significant forces to a physiotherapist’s body.

This situation was made worse due to a heavy workload and intense rate of work, while only short, few, or even no breaks between physical therapies of different patients are usually taken.

Furthermore, participants identified that there were several factors related to the working environment that make the situation even worse and constitute additional potential dangers contributing to MSDs. Such factors can be the insufficient space in the workplace and slippery floors, especially around the swimming pools used for special types of physical therapies. In addition, the long distances that patients have to be moved around, especially in public hospitals or in private rehabilitation centers, high or low temperatures, insufficient lighting, or nonergonomic work equipment could be additional stress factors. Education and practicing special techniques in order to reduce the required forces could play a key role in dealing with these issues.

Almost half of injured respondents chose to work while injured and not to take a long time off for recovery. This could be used as an index to identify the extent of under-reporting of musculoskeletal injuries. In order to deal with musculoskeletal injuries or disorders, most physiotherapists preferred to undertake physical therapy sessions by another colleague, to improve their body position and/or use more ergonomic stances, or chose appropriate techniques for lifting and stabilizing weight. Additionally, some of them indicated that an increase in the number of breaks, as well as their duration, was the most important measure taken. However, this is not always feasible since many of them are private practitioners, coping with increased expenses, taxation, and a large number of patients to treat.

During the period of economic slowdown in Greece, work conditions have deteriorated and MSDs have increased. According to our findings, private practitioners are willing to work longer hours, without special equipment, while employees are willing to work longer hours due to the fear of dismissal, which is in line with the whole status of the Greek labor market [13]. This situation increases MSDs and musculoskeletal injuries, affecting quality of life, while the increased rate of burnout syndrome takes troublesome dimensions [15,16].

Moreover, this situation gives rise to other kinds of risks, such as psychosocial risks [13]. Stress, low wages/profit, the daily physical and emotional contact with patients, and their problems, were additional stress factors that make the situation even worse, as reported by more than half of the participants [17]. This is in addition to the psychological pressure posed on them, causing low self-esteem and dispersion [18]. Such issues could explain why one third of those who participated in our study reported a desire for a career change. This figure resembles the conditions applied to developing countries [19].

To sum up, little attention has been given, especially during the last few years, to musculoskeletal injuries of professionals working in the physical therapy sector in Greece, and measures need to be taken.

5. Conclusion

Physiotherapists in Greece were found to suffer from MSDs, while workplace musculoskeletal injuries were quite common but

under-reported. The body parts mostly affected were the lower back, upper back, shoulders, and neck. Female physiotherapists appear to be more vulnerable, even though male physiotherapists were found to work longer hours.

This study also found that there is a strong correlation between the workplace and the rate of incidence of MSDs. Fewer injuries were suffered by those working in private rehabilitation centers. This could be justified by the fact that private rehabilitation centers usually offer better working conditions and certified/specialized equipment, and they are inspected on a regular basis by the National Labour Inspectorate, performing occupational safety and health audits.

The most common measure taken by physiotherapists to minimize risk of MSDs was found to be physical therapy sessions, followed by improvement of their working position, and ergonomically designed stances. The economic slowdown experienced in Greece during the execution of this study posed additional pressure over physiotherapists, either for those working as employees or for those working as private practitioners, increasing working hours and giving rise to other kinds of risks such as psychosocial risks and depression.

Conflicts of interest

The authors declare no conflict of interest.

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