PREVALENCE OF WORK-RELATED MUSCULOSKELETAL HAND AND WRIST DISORDERS IN PHYSIOTHERAPISTS

Gabriela Škrečková, Pavol Nechvátal, Matúš Kozel, Michal Macej
Department of Physiotherapy, Faculty of Health Care, University of Prešov, Prešov, Slovak Republic

SUMMARY

Objectives: This study examines the prevalence of hand and wrist symptoms and diagnosed disorders in physiotherapists in Slovakia. The aim was to identify risk factors such as occupational settings type, number of patients treated per day and years of clinical practice, and to determine preferred methods of treatment.

Method: The group of 107 physiotherapists (28 men and 79 women) participated in the study. All participants completed a questionnaire created for the purpose. It contained demographic data, years of clinical practice and the questions to determine the presence of various symptoms and injuries to the hand and wrist due to a long-lasting overuse of the hand musculoskeletal system.

Results: Twelve (11.2%) physiotherapists of the observed group did not show any symptoms of functional impairment, and 32 (29.9%) were without any specific hand or wrist disorders. The results confirmed a significant prevalence of symptoms of functional impairment (mean 2.4) and disorders (mean 1.3) with an increased risk in the physiotherapists working in a combined type of occupational settings (outpatient physical therapy and hospital facilities). The most frequently reported symptoms were hand pain (70%) and reduced muscle strength (45.7%). The most frequently reported diagnosed disorder was hand tendonitis (26.2%). The results confirmed the statistically significant correlation ($\alpha = 0.05$) between the years of clinical practice and the number of identified symptoms and disorders ($p < 0.001$) as well as between the number of patients treated per day and the number of symptoms ($p = 0.007$). Hand immobilization (28.6%) and manual therapy (24.4%) were preferred methods of treatment. Surgical intervention was required in 2.2% of hand injuries.

Conclusions: In physiotherapists, long-term performance of manual techniques indicates the development of musculoskeletal disorders of the hand and wrist.

Key words: hand disorders, physiotherapist, wrist disorders

Address for correspondence: P. Nechvátal, Department of Physiotherapy, Faculty of Health Care, University of Prešov, Partizánska 1, 080 01 Prešov, Slovak Republic. E-mail: pavol.nechvatal@unipo.sk

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INTRODUCTION

The profession of a physiotherapist should be performed by qualified workers whose expertise is defined in the White Book of Physical and Rehabilitation Medicine in Europe (1). Their daily practice involves performing specific physiotherapy procedures and techniques that require strength, speed, and flexibility. This work represents a burden at the psychological and physical levels, whereby physiotherapists perceive stress due to the amount of accumulated work, load of administrative duties, and the clinical practice itself (2, 3). In their work, physiotherapists mainly use their hands, by which they therapeutically affect the human body. Almost all procedures performed on patients' bodies are automatically transmitted back into the physiotherapist's hands. Touches, pressures, pulls, movements, and vibrations are felt by therapists on their own bodies. Their hands create a peripheral link of an open kinematic chain, but after touching a patient, the kinematic chain is closed. Every movement emanating from the physiotherapist's hands is thus reflected to his limbs, while the hands eliminate its size.

In the daily practice of their profession, physiotherapists experience stress, even overuse of the tissues of the hand musculoskeletal system. This results from the nature of the manually performed physiotherapy procedures and techniques, which can lead to abrasion and even damage to the wrist and hand structures with a subsequent reduction in work performance and increased absences from work (4–7). The aim of our study was to find out nature, prevalence and methods of treatment of work-related hand and wrist disorders in physiotherapists.

MATERIALS AND METHODS

We carried out our research on hand and wrist related occurrence of selected symptoms and disorders by use of a self-constructed questionnaire. We monitored injuries and damage to the hand and wrist that had developed as a result of performing the profession of a physiotherapist and required treatment for at least 1 week. The questionnaire contained questions aimed at determining the presence of inflammation, distortion, arthrosis, and hypermobility of the wrist joint, tendonitis, nerve damage,

Table 1. *Distribution of respondents by type of occupational settings*

Occupational settings/ clinical practice (years)	≤ 9 years n (%)	10–19 years n (%)	20–29 years n (%)	≥ 30 years n (%)	Total n (%)	Mean no. of years of clinical practice	Mean no. of patients (day)
Outpatient clinics	22 (52.4)	8 (19.1)	8 (19.1)	4 (9.5)	42 (100.0)	13.3	19.2
Hospitals	8 (33.3)	4 (16.7)	7 (29.2)	5 (20.8)	24 (100.0)	18.8	13.5
Combination	15 (36.6)	11 (26.8)	12 (29.3)	3 (7.3)	41 (100.0)	16.5	18.8

Dupuytren's contracture, carpal tunnel syndrome, and ganglion. The observed symptoms included swelling, stiffness, and instability of the wrist joint, paraesthesia, feeling of cold hands, reduced muscle strength, and local pain. The questionnaire was completed by 107 physiotherapists, 28 men (26.2%) and 79 women (73.8%), with a minimum length of clinical practice of 5 years. According to the type of their occupational settings, the respondents were divided into outpatient clinic workers: n = 42 (39.3%); the ones working at the wards of hospitals: n = 24 (22.4%), and those who work in both types of workplaces: n = 41 (38.3%). In Slovakia, no standard for the number of patients per day for physiotherapists has been adopted so far. The number of treated patients depends on the type of workplace and the employer's requirements. Therefore, we accepted the reported number of patients without normative limitations.

Table 2. *Number of diagnoses and symptoms based on occupational settings type*

Incidence (n)	Diagnoses (%)	O/H/C	Symptoms (%)	O/H/C
0	29.9	11.2 10.3 8.4	11.2	4.7 2.8 3.7
1	31.8	13.1 4.7 14.0	15.9	7.5 2.8 5.6
2	23.4	7.5 5.6 10.3	26.2	10.3 5.6 10.3
3	10.3	5.6 1.9 2.8	22.4	7.5 5.6 10
4	2.8	1.9 – 0.9	16.8	4.7 4.7 7.5
5	0.9	– – 0.9	5.6	4.7 0.9 –
6	0.9	– – 0.9	0.9	– – 0.9
7	0	– – –	0.9	– – 0.9
Total		75		107
Absolute abundance: total/mean		140/1.3		260/2.43
Outpatient clinics		1.3		1.4
Inpatient wards		1.0		2.4
Combination		1.5		2.5

Incidence – number of diagnoses/symptoms among physiotherapists; diagnoses – percentage representation of physiotherapists with the corresponding amount of diagnoses; symptoms – percentage representation with the corresponding number of symptoms; O – outpatient clinic; H – hospital ward; C – combination form

All participants provided verbal consent to participate in the study.

Statistical Analysis

We statistically evaluated the obtained data using the Statistica software program. The data are presented as mean (SD) or as percentages. The level of statistical significance was set at $p < 0.05$. We used the parametric ANOVA to test the influence of the observed factors, nonparametric Kruskal-Wallis test for more than 2 categories, and the chi-squared test to divide the frequency in individual categories. Descriptive statistics of distribution of the respondents based on their occupational settings type, average number of patients treated per day, and years of their clinical practice are shown in Table 1.

Physiotherapists working in outpatient clinics treat the most patients per day (average 19.2 patients), but at such a work pace they stay at the occupational settings the shortest time (average 13.3 years) (Table 1).

RESULTS

Table 2 presents the descriptive statistics of the occurrence of functional impairment symptoms and the diagnosed hand and wrist disorders, which are directly related to the performance of the work of physiotherapists. The number of observed symptoms and diagnoses is divided according to the type of occupational settings: outpatient clinics, hospital wards, and their combination.

The highest prevalence of symptoms and diagnoses of functional impairment of the hand was found in the physiotherapists who work in a combined form at both outpatient and hospital occupational settings. The mean number of symptoms was 2.5, diagnoses 1.5.

We determined the occurrence of the reported symptoms and diagnosed disorders in the participants' work histories. Figure 1 demonstrates that the majority of respondents (n = 75, 70.1%) suffer from pain while working. The second most frequent

Table 3. *Analysis of practice length and number of patients on occurrence of symptoms and diagnoses*

Variables	Coefficients of determination R^2	Correlation coefficient r	p-value
Number of patients/diagnoses	0.059	0.243	0.001
Number of patients/symptoms	0.105	0.325	<0.001
Length of practice/diagnoses	0.315	0.561	<0.001
Length of practice/symptoms	0.295	0.543	<0.001

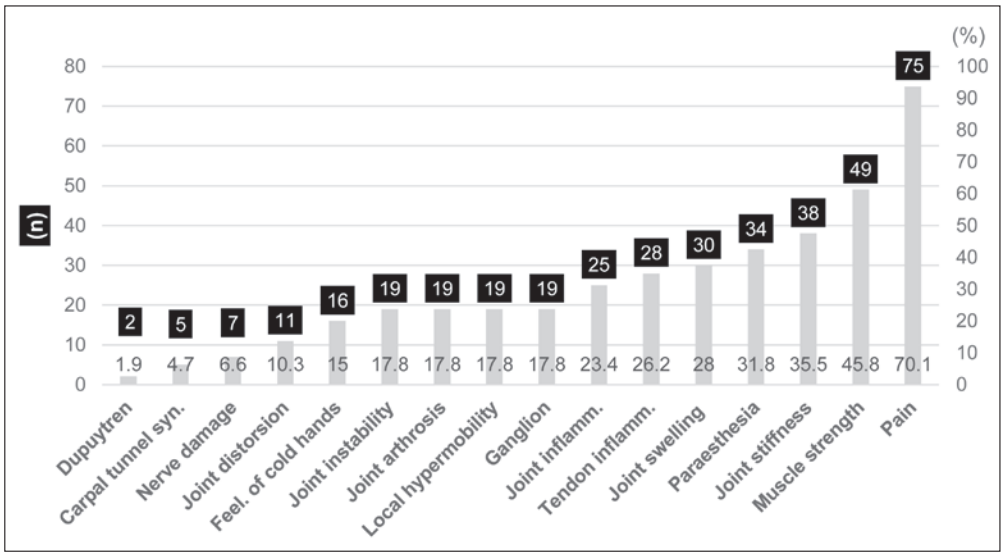

Fig. 1. *Incidence of symptoms and diagnoses in physiotherapists by frequency.*

symptom was a decrease in muscle strength (n = 49, 45.8%). Dupuytren's contracture showed the lowest incidence (n = 2, 1.9%).

The association of occurrence of individual symptoms and diagnoses in the work anamnesis of the physiotherapists with the number of patients treated per day and the number of years of practice was determined using Pearson's correlations. We present the results of the correlations in Figures 2–5. We found a strong correlation between the length of practice and the number of diagnoses (r = 0.561) and the number of symptoms (r = 0.543) (Table 3).

The dependence of the occurrence of individual symptoms and diagnosed disorders in the work anamnesis of the physiotherapists on the length of practice, occupational settings and number of patients treated per day was determined using the

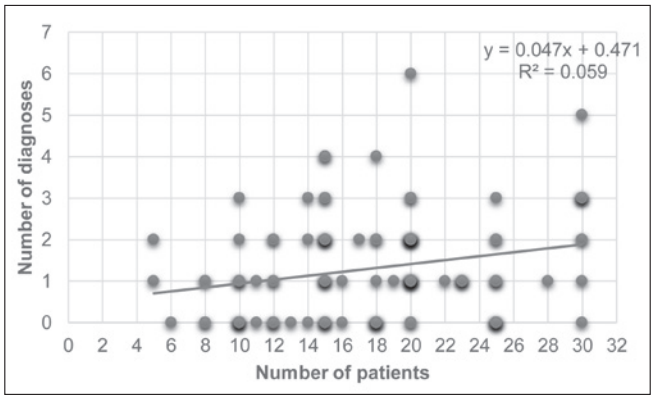

Fig. 2. *Correlation between number of diagnoses and number of treated patients.*

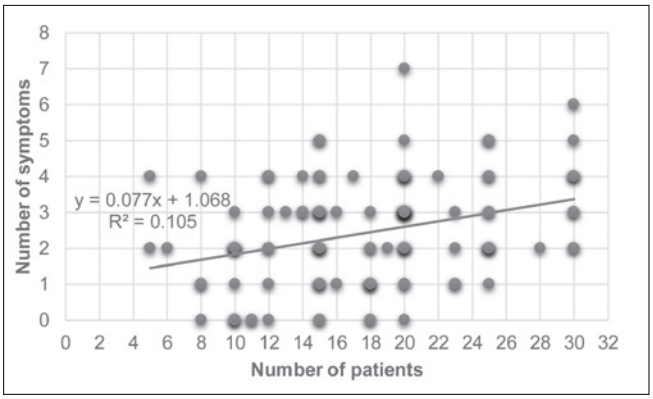

Fig. 3. *Correlation between number of symptoms and number of treated patients.*

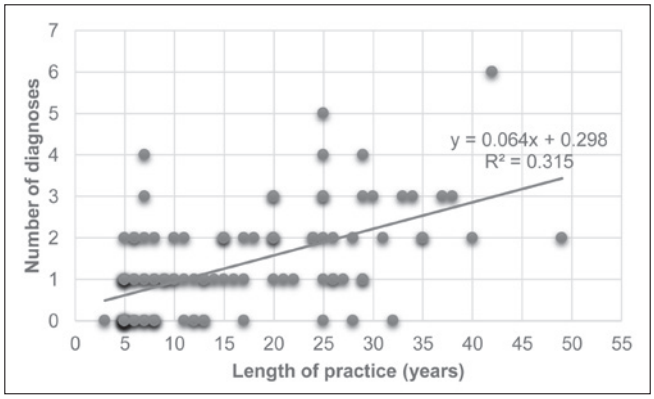

Fig. 4. *Correlation between number of diagnoses and length of practice.*

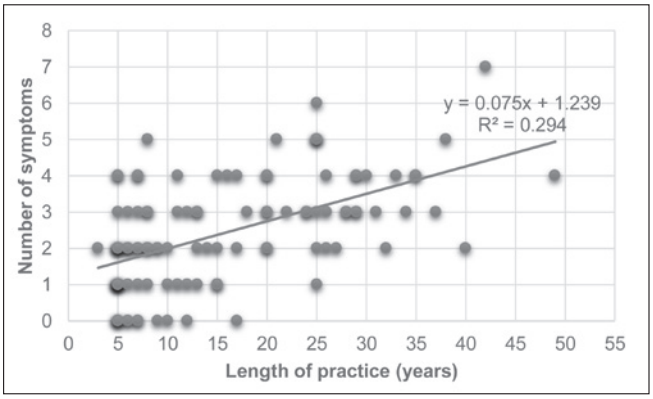

Fig. 5. *Correlation between number of symptoms and length of practice.*

Table 4. *Incidence of symptoms and diagnoses depending on number of patients, occupational settings and length of practice*

Observed phenomenon	Average incidence	Frequency of incidence (n)	Length of practice (p-value)	Occupational settings (p-value)	Number of patients (p-value)
Joint inflammation	0.23	25	**0.012**	0.672	0.343
Joint swelling	0.28	30	0.062	0.408	0.431
Joint stiffness	0.36	38	**0.009**	0.309	0.133
Joint instability	0.18	19	0.384	0.157	0.522
Joint distortion	0.10	11	0.611	0.183	0.162
Joint arthrosis	0.18	19	**0.029**	0.500	0.853
Local hypermobility	0.18	19	0.832	0.128	0.676
Tendon inflammation	0.26	28	0.130	0.902	0.753
Nerve damage	0.07	7	0.222	0.866	0.091
Feeling of cold hands	0.15	16	0.711	0.094	0.283
Paraesthesia	0.32	34	0.558	**0.031**	0.344
Muscle strength	0.46	49	**0.042**	0.942	0.120
Pain	0.70	75	0.253	0.282	**0.033**
Dupuytren's contracture	0.02	2	0.763	0.747	0.077
Carpal tunnel syndrome	0.05	5	0.244	0.593	0.591
Ganglion	0.18	19	0.169	**0.001**	0.564

Numbers in bold indicate statistically significant values.

nonparametric ANOVA test – Kruskal-Wallis test for more than 2 categories (Table 4).

The length of practice of the physiotherapists included in our research group was a predisposing factor for the development of inflammation ($p = 0.012$), stiffness ($p = 0.009$), arthrosis of the joint ($p = 0.029$), and reduction of muscle strength ($p = 0.042$). The occupational settings of the physiotherapists was a predisposing factor for the development of paraesthesia ($p = 0.031$) and ganglion cyst ($p = 0.008$). A higher number of treated patients induces a hand pain ($p = 0.033$). From these results we can conclude that the length of clinical practice affects the deterioration of physiotherapists' health condition more than the number of treated patients.

The advantage of physiotherapists is their ability to quickly recognize warning signs of functional tissue damage, followed by immediate application of a treatment procedure in the form of self-treatment or seeking medical attendance. We asked the survey respondents about the therapeutic procedures most frequently applied for individual manifestations of damage to the hand and wrist. Figure 6 shows the preferred treatment methods. Treatment of the symptoms of damage and diagnosed hand disorders combined several methods of physiotherapy. From the total number of 842 (100%) therapeutic action, the most frequently chosen methods of conservative therapy were immobilization (n = 241, 28.6%), manual therapy (n = 205, 24.4%), and physical therapy (n = 199, 23.6%). Among the preferred forms of treatment were also application of kinesiology tapes (n = 97, 11.5%), thermotherapy (n = 55, 6.5%), and alternative therapy (n = 27, 3.2%); 2.2% (n = 18) of work-related hand and wrist injuries required surgical intervention.

DISCUSSION

The nature of the procedures performed by physiotherapists is closely related to their occupational settings. Studies confirm that work-related musculoskeletal damage and injuries of a ver-

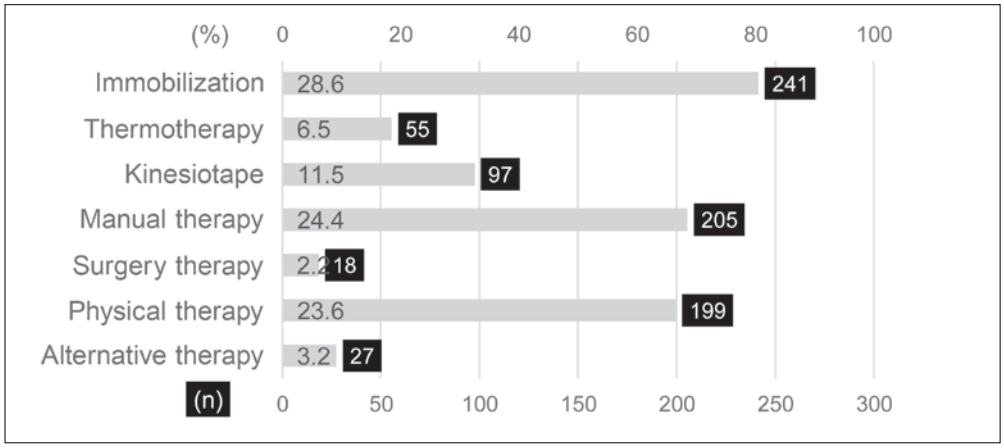

Fig. 6. *Preferred methods of treatment.*

tebrogenic nature mostly occur in physiotherapists working in hospital facilities (4, 8–10). Physiotherapists working in outpatient clinics and performing manual techniques have an increased risk of injuries to the hand due to compression, traction, and strength demands (6, 11, 12). In some hospital facilities in Slovakia, physiotherapists work by a system of regular rotation of work in a ward and in an outpatient clinic. In our study, this type of work arrangement proved to be the most risk for physical therapists' hands. The results confirmed a significant prevalence of symptoms of functional impairment (mean 2.4) and prevalence of diagnosed disorders (mean 1.3) with an increased risk for physiotherapists working in this combined system.

The lifetime prevalence of hand and wrist disorders and diseases in physiotherapists in the world is estimated at 15–46%, while the annual prevalence is 5–30% (11). Cromie et al. (6) state that 1 out of 6 physiotherapists leave the profession due to the occurrence of work-related musculoskeletal damage. In our study, each physiotherapist was diagnosed with disorders (mean 1.3) or symptoms (mean 2.4) that had developed in their hands, and their number increased with increasing years of clinical practice. The most frequently reported symptoms of impending functional impairment of the wrist and hand were pain (70.1%), reduced muscle strength (45.8%), joint stiffness (35.5%), and joint swelling (28.0%).

So far published studies looking at functional hand and wrist injuries in physical therapists have differed in designs and methodology. A relevant agreement can be seen in causes and manifestations of hand injuries. In their study, McLeod et al. (13) monitored occupational injuries in 160 Australian osteopaths, confirming a 41% incidence of wrist and finger injuries. Repetitive therapeutic procedures (52%) and manipulation techniques (23%) were reported as the most common causes. A study by American scientists (12), which confirmed a 75% annual prevalence of the hand and wrist pain in 962 physiotherapists, identified its risk factors: old age, lower level of work experience, female gender, more working hours of manual therapy, and working more than 40 hours a week. Cromie et al. (6) mention the large number of treated patients and the continuation of work despite the injury as the cause of pain.

The techniques requiring extreme repetitive use of the hands in unnatural angular positions predispose to joint and muscle pain. Our study confirmed the dependence of pain on the number of treated patients. These symptoms are a pre-diagnostic factor of joint inflammation and arthrosis, the risk of which increases with increasing years of clinical practice (6, 14). The negative impact of compressive and traction forces on the joints of the thumb while performing the work of a physiotherapist has been confirmed in several studies. Wajon and Ada report a 83% incidence of thumb pain, Rossettini et al. 49.3%, and Abidin et al. 83.9% (15–17). A study by Snodgrass et al. (14) confirmed reduced muscle strength and joint instability in 24 physical therapists with thumb pain who had performed manual techniques.

The increased workload, shortage of time, and lack of recovery naturally lead to structural changes along with the gradual development of a specific disorder. They limit activity and reduce performance and its quality (18). Fatigue pains that appear first are mostly overlooked. The cause of muscle pain is stereotyped long-term activities that involve unilateral isometric muscle load (15). Long-term excessive stress put on the hands causes structural changes. Damage to nerves, joints, and bones already leads to incapacity for work. So far, there are no studies that would comprehensively monitor the most common symptoms and disorders of the hands in physiotherapists. Our study on the occurrence of symptoms includes a survey of diagnosed, work-related disorders. The most frequently reported diagnosed damage was hand muscle tendonitis (26.2%), joint inflammation (23.4%), and hand joint arthrosis (17.8%). In their study, Snodgrass et al. (14) report osteoarthritis in the hand region with a prevalence of 22.7%, and joint hypermobility in 6.4% of physiotherapists.

Physiotherapists have one big advantage over other professions experiencing similar health complaints (19) – they are familiar with the issue. For this reason, they often choose self-treatment as a suitable approach. A study by Taiwanese scientists (20) points out that experienced physiotherapists with many years of clinical experience purposefully change the compressive action of the thumb and develop force more effectively during manual techniques, thus consciously protecting their limbs from overuse. Self-treatment was the most frequently chosen method among our respondents. Each physiotherapist sought medical attendance on average 1.4 times (average of the determined diagnoses). Physiotherapists included in our study preferred joint immobilization therapy in 28.6%, manual therapy in 24.4%, and physical therapy in 23.6% of cases of hand and wrist injuries. An Irish cohort study (21) following the effect of taping the thumb before performing manual techniques in 40 physiotherapists confirmed the effectiveness of angulation of the thumb joint, resulting in a reduction of thumb pain.

Recommendations

Any damage to the locomotor system requires adequate time for recovery. Negative long-term mechanical activity affects the contractile system of the muscles without the formation of an action potential. This leads to muscle fatigue (22). If we want to avoid a recurrence, it is necessary to work with alleviation for a certain period of time. That means shorter working hours or the reduced performance of particularly physically demanding tasks.

CONCLUSION

Physiotherapists should know their physical limits because their hands are their working tool that they use every day. Therefore, it is necessary to become familiar with the factors that significantly contribute to the occurrence of hand and wrist joint damage.

From this point of view, the most risk work classification appears to be a combined form of work, in hospital and outpatient facilities. The number of treated patients per day does not play a significant role in this case. On the contrary, the physiotherapist's length of service correlates with a higher incidence of disorders.

Conflicts of Interest
None declared

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