Work-related musculoskeletal disorders among physical therapists

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Work-Related Musculoskeletal Disorders Among Physical Therapists

Background and Purpose. Increasing evidence suggests that musculoskeletal disorders are common in workers in the United States health care industry. Physical therapists, who commonly treat patients with these disorders, are also at risk for work-related musculoskeletal disorders (WMD) in the upper limbs and low back. The purpose of this study was to determine the prevalence of WMD during a 12-month period and the job factors that may be associated with these disorders in physical therapists. Subjects. A four-page questionnaire was mailed to physical therapists (N=1,160) who attended The University of Iowa between 1943 and 1993. Nine hundred twenty-eight questionnaires were returned (80% response rate) from physical therapists in 46 states. Methods. Based on a literature review and pilot study of physical therapists, a survey instrument was constructed consisting of a symptom survey, a job-factor survey, and various demographic information. Results. The highest prevalences of WMD among physical therapists were in the following anatomical areas: low back (45%), wrist/hand (29.6%), upper back (28.7%), and neck (24.7%). The job factor rated most likely to contribute to job-related musculoskeletal disorders was “lifting or transferring dependent patients.” The prevalence of WMD in physical therapists also was affected by work setting, practice specialty, age of patient, and gender of therapist. Conclusion and Discussion. Specific strategies should be developed to reduce WMD in the practice of physical therapy. [Bork BE, Cook TM, Rosecrance JC, et al. Work-related musculoskeletal disorders among physical therapists. Phys Ther. 1996;76:827–835.]

Key Words: Musculoskeletal disorders, Occupational injuries, Physical therapy.

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The US Department of Labor estimates that more than 10 million Americans will work in health care by the year 2000, making the health care industry the third largest employer in the United States.\(^1\) Ironically, the health care industry has an employee injury rate that is higher than that of other service industries.\(^2,3\) Nursing homes, for example, led all other industries in the rate of injuries due to overexertion or to workers falling.\(^4\)

Disorders of the musculoskeletal system are common among health care workers, with the nursing population at particularly high risk.\(^5-7\) Although nurses represent just 33% of the hospital work force, they account for 60% of the reported occupational injuries.\(^8\) Occupational back pain is an especially frequent complaint. Harber et al\(^9\) reported that 52% of nurses reported experiencing work-related back pain within a 6-month period. Lifting patients in bed, transferring patients out of bed, and lifting patients from the floor were the job activities most commonly reported as sources of back pain among nurses.\(^9,10\)

Although nurses, nursing aides, and orderlies have the highest rates of work-related musculoskeletal disorders (WMD) in medical services,\(^4\) physical therapists also are exposed to many of the same occupational risk factors leading to WMD, especially with regard to the low back. In a study of 344 physical therapists, 29% reported having work-related low back pain within a 12-month period.\(^11\) Sixty-four percent of those reporting back pain were 30 years of age or younger. The job-related tasks most commonly reported as contributing to low back injury were “lifting with sudden maximal effort” and “bending and twisting.”\(^11\) In a study of 243 physical therapists in Great Britain, Scholey and Hair\(^12\) found an annual prevalence of work-related back pain of 38%. These researchers also determined that the initial episode of back pain most often occurred in therapists between the ages of 21 and 30 years.

Although several authors have reported the prevalence of work-related low back pain among physical therapists, the prevalence of WMD in other anatomical areas has not been investigated on a broad scale. Because physical therapists may routinely perform manual therapy such as soft tissue mobilization, the upper limb is also exposed to the risk factors associated with musculoskeletal as well as neurovascular disorders. The three primary risk factors that have been associated with WMD are repetitive movement, awkward postures, and high force levels.\(^13\) Physical therapists also may routinely perform activities such as transferring dependent patients, assisting patients in gait, providing manual resistance, assisting with mat activities, and lifting heavy and cumbersome equipment. These work tasks put therapists at risk for both acute and cumulative WMD. Because the job tasks in the physical therapy profession can be very physically challenging, further research is needed to determine the effects that work-related physical demands have on physical therapists.

The purpose of this study was to determine the prevalence of WMD over a 12-month period and the job factors that may be associated with these disorders among physical therapists. Associations between job...
Factors and prevalence rates were determined to investigate the influence of specific work tasks. By determining the extent and nature of WMD among physical therapists, adequate methods of prevention may be formulated.

Method
Self-administered questionnaires were mailed with first-class postage to all persons who graduated from the University of Iowa Physical Therapy Program between the years of 1943 and 1993 and who, according to alumni records, were assumed to be living. Twelve questionnaires were returned undelivered due to incorrect addresses. One questionnaire was returned from the family of a recently deceased graduate, and 1 questionnaire was returned from the conservator for a seriously ill graduate. Thus, 1,160 questionnaires were assumed to have reached their address. A cover letter stated the purpose of the study and assured the respondents that their questionnaire would remain confidential. To follow up on nonrespondents, each questionnaire was coded with a unique number that corresponded to a master list of names.

The self-administered questionnaire was derived from several standardized questionnaires developed for investigating WMD in working populations. The survey instrument was pilot tested on a group of 20 physical therapists who were not involved in the project and were graduates of other physical therapy programs.

The survey instrument was designed to elicit general information on years of practice, work status, work setting, practice specialty, patient population, and physical therapy activities. Recipients were requested to provide demographic data such as age, height, weight, and gender. The questionnaire also included a symptom survey, job-factor survey, and several open-ended questions.

The symptom-survey section was a modification of the standardized Nordic Questionnaire and consisted of questions referring to nine body areas. A simple body figure with 9 body areas highlighted (5 upper limb, 3 lower limb, and 3 trunk) was incorporated to help the respondents answer “yes” or “no” to the question, “During the last 12 months, have you had a job-related ache, pain, discomfort, and so on, he or she fit our definition of WMD. This definition was used for surveillance purposes only and was not considered to represent any specific pathology.

The job-factor section of the questionnaire concerned the workers’ perceptions of the physically stressful elements in their job. This portion of the questionnaire contained a listing of 17 conditions and tasks with the following instructions: “This list describes things at work that could contribute to job-related pain and injury. Please indicate, on a scale of 0 to 10, how much of a problem (if any) each item is for you by circling the appropriate number.” A score of 0 to 1 was equivalent to a job factor being “no problem,” a score of 2 to 7 was rated as a “minimal to moderate problem,” and a score of 8 to 10 indicated that a job factor was considered a “major problem.” The job factor descriptions are presented in Table 1.

Several strategies were used to maximize the questionnaire return rate. We hand-signed all cover letters and enclosed a stamped, preaddressed return envelope. As further incentive, university sweatshirts were raffled off to 10 randomly selected respondents. Respondents were asked to complete and return the questionnaire within 2 weeks. Reminder postcards were sent to all questionnaire recipients 1 week later. Approximately 3 weeks
after the initial mailing, a second copy of the question-naire was mailed to all nonrespondents.

**Data Analysis**
In this epidemiological study, a cross-sectional design was used to determine the prevalence of WMD. Prevalence rates for the 12-month period were calculated by dividing the number of physical therapists who reported a WMD in a specific anatomical area by the total number of responses to the question. The percentage of physical therapists who reported missing work due to the WMD and the percentage who reported going to a physician as a result of the WMD were calculated in the same manner. We analyzed the job-factor data by calculating the percentage of physical therapists who reported a factor as problematic by rating it 7 or greater on the 11-point scale.

Data were entered into the Paradox relational database program and analyzed using Statistical Analysis System software. Descriptive statistics were determined for the demographic variables. Chi-square analysis was used to determine significant differences in the prevalence of self-reported musculoskeletal symptoms among physical therapists with various job and personal characteristics. Chi-square analysis was performed using 2x2 contingency tables. Mantel-Haenszel odds ratios (OR) and upper and lower 95% confidence intervals (CI) were calculated to estimate the relative risk of work-related musculoskeletal symptoms among physical therapists with specific job tasks and demographic characteristics.

**Results**

**Demographics**
Nine hundred twenty-eight questionnaires were returned, for an overall response rate of 80.0%. The average age of the respondents was 43 years (SD=12, range=25-78), with women and men accounting for 52% and 48% of the sample, respectively (Tab. 2). The respondents were from 46 states, the District of Columbia, and three foreign countries. The 8 states with the most respondents were Iowa (35.3%), Illinois (7.1%), Minnesota (6.2%), Wisconsin (5.4%), California (4.2%), Michigan (4.2%), Colorado (3.7%), and Arizona (2.9%). The number of hours per week a physical therapist spent in direct patient care varied by work setting, and averaged 28.5 hours (Tab. 3). Hospitals were found to be the most common work setting among the respondents (31.3%).

The demographic data concerning the 232 nonrespondents was limited to estimated age, gender, and geo-
Table 3.
Distribution of Questionnaire Respondents by Work Setting

<table>
<thead>
<tr>
<th>Work Setting</th>
<th>Percentage</th>
<th>Age (yr) X</th>
<th>SD</th>
<th>Range</th>
<th>Hours per Week in Direct Patient Care X</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital</td>
<td>31.3</td>
<td>42.6</td>
<td>12.5</td>
<td>25-78</td>
<td>29.8</td>
<td>14.1</td>
<td>0-60</td>
</tr>
<tr>
<td>Rehabilitation center</td>
<td>5.0</td>
<td>39.9</td>
<td>10.1</td>
<td>25-64</td>
<td>29.8</td>
<td>14.1</td>
<td>0-65</td>
</tr>
<tr>
<td>Private office</td>
<td>14.2</td>
<td>44.2</td>
<td>10.7</td>
<td>26-73</td>
<td>36.8</td>
<td>12.8</td>
<td>0-60</td>
</tr>
<tr>
<td>Skilled nursing facility</td>
<td>9.5</td>
<td>43.1</td>
<td>12.2</td>
<td>27-74</td>
<td>25.4</td>
<td>12.0</td>
<td>0-50</td>
</tr>
<tr>
<td>Outpatient center</td>
<td>15.2</td>
<td>37.2</td>
<td>9.3</td>
<td>25-66</td>
<td>33.7</td>
<td>12.4</td>
<td>0-80</td>
</tr>
<tr>
<td>Home health</td>
<td>9.1</td>
<td>45.9</td>
<td>12.1</td>
<td>27-74</td>
<td>26.4</td>
<td>14.2</td>
<td>3-70</td>
</tr>
<tr>
<td>School system</td>
<td>5.8</td>
<td>45.7</td>
<td>10.6</td>
<td>28-74</td>
<td>25.0</td>
<td>8.3</td>
<td>6.5-50</td>
</tr>
<tr>
<td>Industrial rehabilitation</td>
<td>1.7</td>
<td>40.0</td>
<td>8.1</td>
<td>31-61</td>
<td>25.2</td>
<td>16.3</td>
<td>0-50</td>
</tr>
<tr>
<td>Academia</td>
<td>5.3</td>
<td>44.0</td>
<td>8.1</td>
<td>29-65</td>
<td>6.8</td>
<td>9.0</td>
<td>0-38</td>
</tr>
<tr>
<td>Other</td>
<td>2.5</td>
<td>44.7</td>
<td>11.5</td>
<td>28-73</td>
<td>14.9</td>
<td>17.2</td>
<td>0-50</td>
</tr>
</tbody>
</table>

Graphical location. The mean nonrespondent estimated age (derived from graduation date) was 51.5 years (SD=12.4). Forty percent of the nonrespondents were women, and 60% of the nonrespondents were men. In the eight states with the most respondents, the nonresponse rates varied between 18% and 22%, similar to the overall nonresponse rate of 20.0%. The respondents in this study were similar to the respondents in the American Physical Therapy Association (APTA) 1993 Active Membership Profile Report® in age, years as a physical therapist, and work setting.

Symptom Survey
The respondents reported the highest 12-month prevalence rates for WMD in the low back (45.0%), wrist and hands (29.6%), upper back (28.7%), and neck (24.7%) (Fig. 1). Low back pain required the largest percentage (2.8%) of physical therapists to miss work during the 12-month period. The most common WMD causing respondents to see a physician were in the low back (2.9%) and in the wrist and hands (2.3%). The 12-month prevalence of WMD for the low back, wrist and hands, upper back, and neck varied considerably by age group, but was lowest in the respondents who were over 50 years of age (Fig. 2). The number of hours a physical therapist devoted to direct patient care, however, varied little with respect to age group (Fig. 2).

Job-Factor Survey
The respondents rated “lifting or transferring dependent patients” as the job factor most problematic in terms of tasks that may lead to work-related injury. Twenty-six percent of the respondents rated this job factor as 7 or greater on the 11-point scale (Tab. 1). Only 1.2% of respondents rated “inadequate training on injury prevention” as problematic in terms of tasks that may lead to work-related injury.

Twenty-five percent of the respondents indicated that they had had to change their working activities as a result of WMD. The most commonly cited changes included altering the frequency or technique of manual therapy, avoiding stressful positions, and improving body mechanics. When asked about the mechanisms for work-related injuries, the most common responses were lifting or transferring patients, catching patients during falls, and lifting heavy equipment. When asked what work-related tasks put physical therapists at greatest risk of injury, 540 respondents (58%) specified lifting or transferring patients. One hundred fifteen respondents (12%) indicated performing manual therapy techniques (joint mobilization, soft tissue mobilization, manual resistive exercise) and 97 respondents (10%) indicated assisting patients during gait activities as the tasks that put therapists at greatest risk for WMD.

Forty percent of the respondents indicated that they had sustained an injury outside of their practice setting that was later exacerbated by their work as a physical therapist. The most commonly listed non–work-related injury was sports-related and involved the knee or back. Slightly over 61% of the respondents indicated that they had treated themselves or had sought treatment from a colleague for a work-related ache or pain.

Influencing Factors
Physical therapists working in hospitals reported a higher prevalence of musculoskeletal problems in every anatomical area except the wrists and hands and the hips and thighs than did non–hospital-based therapists (Fig. 5). Chi-square analysis revealed that the prevalence of WMD was higher in the low back ($P=.006$) and in the ankles and feet ($P=.006$) for physical therapists working in hospitals.

Physical therapists were asked to indicate the activities they routinely performed as part of their practice (eg, manual therapy, neurological rehabilitation, pediatrics). Therapists who routinely performed manual therapy (n=272) had a higher prevalence of self-reported mus-
Figure 1.
Percentages of physical therapists reporting musculoskeletal symptoms, missed work, and physician visits as a result of work-related symptoms (N=928).

<table>
<thead>
<tr>
<th>Anatomical Area</th>
<th>Percentage With Symptoms</th>
<th>Percentage Missing Work</th>
<th>Percentage Visiting Physician</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>24.7</td>
<td>0.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Shoulders</td>
<td>18.9</td>
<td>0.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Upper Back</td>
<td>28.7</td>
<td>0.7</td>
<td>1.3</td>
</tr>
<tr>
<td>Elbows</td>
<td>8.0</td>
<td>0.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Low Back</td>
<td>45.0</td>
<td>2.8</td>
<td>2.9</td>
</tr>
<tr>
<td>Wrists/ Hands</td>
<td>29.6</td>
<td>1.0</td>
<td>2.3</td>
</tr>
<tr>
<td>Hips / Thighs</td>
<td>4.7</td>
<td>0.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Knees</td>
<td>10.9</td>
<td>1.0</td>
<td>1.7</td>
</tr>
<tr>
<td>Ankles / Feet</td>
<td>10.7</td>
<td>0.5</td>
<td>1.6</td>
</tr>
</tbody>
</table>

culoskeletal symptoms in the elbows (P=.003) and in the wrists and hands (P<.001) than did the therapists who did not report routinely performing these techniques. Physical therapists who routinely performed manual therapy were 3.5 times more likely (OR=3.49, 95% CI=2.54–4.79) to have had musculoskeletal symptoms in the wrists and hands than physical therapists who did not routinely perform manual therapy. Physical therapists who routinely performed neurologic rehabilitation (n=245) had a higher prevalence (P<.05) of self-reported musculoskeletal symptoms in upper back, low back, and knees than did therapists who did not routinely perform neurologic rehabilitation.

The relationship between the therapist's musculoskeletal symptoms and the age of the patients treated (adult versus pediatric) also was investigated. Chi-square analysis revealed that self-reported musculoskeletal symptoms were more prevalent (P<.05) in the neck, upper back, hips and thighs, and knees in pediatric physical therapists than in therapists who primarily treated adults.

Figure 2.
Effects of age on the 12-month prevalence of work-related musculoskeletal disorders in selected anatomical areas and on the number of hours worked each week in direct patient care.
Comparisons between hospital-based and non-hospital-based physical therapists of the 12-month prevalence of work-related musculoskeletal disorders in nine anatomical areas. Asterisk (*) indicates P<.05 (chi-square analysis).

Physical therapists treating children (<12 years of age) were 3.5 times more likely (OR=3.54, CI=1.78–7.04) to have had musculoskeletal symptoms in the knees than were therapists treating adults.

Examination of musculoskeletal symptoms by gender revealed that female physical therapists had a higher prevalence of self-reported symptoms in every anatomical area except the knees than did male physical therapists (Fig. 4). Chi-square analysis revealed that the prevalence of WMD in the neck, upper back, low back, and wrists and hands was greater (P<.05) in female physical therapists than in male physical therapists. Additionally, 73% of the female physical therapists reported at least one musculoskeletal symptom as compared with 57% of the male physical therapists.

**Discussion**

The questionnaire used in this study was sent only to graduates of The University of Iowa Physical Therapy Program. Thus, some sampling bias was inherent in the study design. The response rate was 80%, and the nonrespondents were evenly distributed by geographical location. Female physical therapists accounted for 52% of the respondents and for 40% of the nonrespondents, indicating that women were better represented than men in our data. The nonrespondents were approximately 8 years older than the respondents, suggesting that older and perhaps retired physical therapists may have been among those for whom we did not have data.

The demographic characteristics (e.g., age, type of work setting, years of practice) of the respondents in this study, however, were similar to those reported in the APTA 1993 Active Membership Profile Report.18

Although a high percentage (61%) of physical therapists experienced work-related musculoskeletal symptoms in at least one anatomical area, very few respondents missed work due to these conditions. Low back pain was the only WMD that caused more than 1% of respondents to miss work. The percentage of physical therapists who saw a physician for work-related musculoskeletal symptoms was very low. A possible explanation for this finding could be that the high percentage of respondents (61%) who indicated that they treated themselves or sought treatment from a colleague, thus rendering a visit to a physician or requiring absence from work unnecessary. Another possible reason could be that physical therapists continue to work when injured; 15.2% of the respondents rated “working while injured or hurt” as a moderate to major job problem.

The relatively high prevalence (45%) of work-related musculoskeletal symptoms reported in the low back among physical therapists in this study is consistent with the results of several studies on the prevalence of back pain in other health care professionals.9,10 Smedley and associates,10 who surveyed 1,616 female nurses, reported a 12-month prevalence of low back pain of 45%. In a survey of 344 physical therapists, Molumphy et al.11 found the prevalence of job-related low back pain that lasted 3 days or longer to be 29%. This figure is somewhat lower than our result and is probably due to differences in definitions. Molumphy et al.11 defined low back pain as having a duration of at least 3 days. We did not include duration of symptoms as a criterion. Although the prevalence of job-related low back disorders is moderately high for physical therapists, it is considerably higher in other occupations. Using the identical symptom survey instrument, Rosecrance and associates16,17 reported a prevalence of WMD in the low
back of 51% for office workers and 61% for newspaper production workers. Using a similar survey instrument, Cook and Zimmermann \(^{11}\) determined that 75% of construction workers from various trades had WMD in the lower back.

Wilkinson et al \(^{7}\) and Harber et al \(^{8}\) cited lifting patients as the most common mechanism of back injury among nurses. Molumphy et al \(^{11}\) reported that 83% of the physical therapists they surveyed were working with a patient when the therapists first experienced low back pain. The most common mechanisms of injury reported by the physical therapists was lifting with sudden maximal effort and bending or twisting. \(^{11}\) Lifting and transferring dependent patients also was the job factor rated most problematic by the therapists in our study. When therapists were asked the open-ended question "What job-related tasks put physical therapists at greatest risk of injury?" 58% of our respondents indicated either lifting or transferring patients. Biomechanical investigations \(^{19},^{20}\) have confirmed that lifting and transferring patients generates high spinal stresses.

Work-related wrist and hand symptoms also were a problem for nearly one third of the therapists in our study. Physical therapists who indicated that they routinely performed manual therapy were 3.5 times more likely to have wrist or hand symptoms than those who did not perform these techniques. This finding suggests that manual therapy techniques are a major source of upper-limb musculoskeletal stress. More than 60% (65.5%) of the respondents commented that they changed their manual therapy activities due to painful hands or fingers. These changes included reduced scheduling of patients needing manual therapy, allowing time for breaks, and modifying techniques to reduce the amount of stress placed on the wrists and hands.

Physical therapists who worked in hospital-based settings had a greater prevalence of work-related musculoskeletal symptoms in the low back than did non–hospital-based therapists. This finding is consistent with Molumphy and colleagues’ finding of a high incidence of low back pain among physical therapists in acute care settings. \(^{13}\) The greater prevalence of low back symptoms among hospital-based therapists may be attributed to the level of physical dependence of patients. Patients in hospital settings are more likely to have acute and more extensive injuries than are patients seen in ambulatory settings. Physical therapists are more likely to perform patient lifts and transfers involving greater physical effort in the hospital environment. Physical therapists in outpatient facilities, however, were more likely to have wrist or hand symptoms than were their hospital-based counterparts. This finding is probably related to the greater frequency of manual therapy performed by the therapists in non–hospital-based locations.

Our study demonstrated that the age of the therapist had some effect on the prevalence of WMD. The prevalence for WMD in the low back ranged between 42% and 52% from age 25 to 50 years. After age 50 years, the prevalence of WMD in the low back declined to 34%. The respondents who were over 50 years of age had the lowest rates of WMD in the neck, upper back, and wrists and hands as well. Molumphy et al \(^{11}\) reported a similar finding, that is, as the age of the physical therapist increased, the percentage of individuals experiencing low back pain for the first time decreased. The authors suggested that the age-prevalence trend resulted from physical therapists moving out of patient care as they gained experience and into administrative positions that are less physically demanding. Our data, however, do not support the hypothesis that as physical therapists become older, they have less direct contact with patients (Fig. 2). The >55-year-old age group in our study had a higher average for patient-contact hours per week than all but the youngest age group. An alternative explanation of the low prevalence of WMD in older therapists may be related to a survivor bias. As physical therapists become older, the survivors are those who develop strategies for coping with the physical demands of the job and who continue to treat patients. The strategies may include modification of treatment techniques, performing therapies that are less strenuous, and increasing the use of support staff to perform the physically difficult or fatiguing work. Physical therapists who do not adopt injury-prevention strategies may retire early, move into a new field such as academia, or continue to work with occasional musculoskeletal pain.

In our study, female respondents indicated a higher prevalence of WMD than did male respondents in every anatomical area except the knees. Molumphy et al \(^{11}\) in their study of physical therapists in California, found that the prevalence of low back pain was not different between male and female therapists. Unfortunately, the authors did not report the exact prevalence of low back pain for each gender. The higher prevalence of WMD among female physical therapists may be related to their weight and height. Female respondents were generally smaller than male respondents (Tab. 2) and may be at a physical disadvantage when lifting or transferring larger patients. Additionally, numerous female respondents commented on the stress that pregnancy superimposed on their work as a physical therapist. According to their responses, the stress of pregnancy often led to an exacerbation of symptoms, particularly sacroiliac problems.
Conclusions
The prevalences of WMD among physical therapists were highest in the low back, wrists and hands, upper back, and neck. The job factor rated most problematic for the physical therapists in our study was lifting and transferring dependent patients. Although physical therapists have knowledge and clinical expertise in musculoskeletal injuries, these proficiencies do not constitute an immunity to their own work-related musculoskeletal disorders. Thus, specific strategies should be developed to reduce WMD in the practice of physical therapy and to prevent potentially disabling conditions. The results of this study indicate that particular attention should be given to techniques for manual handling of patients and to hand-intensive manual therapy techniques. Further investigation is needed to develop preventive measures that preserve the health of workers in an occupation devoted to the promotion and restoration of health.

References