International Journal of Occupational Safety and Ergonomics (*JOSE*) 2012, Vol. 18, No. 1, 15–26

Validity and Reliability of a Job Factors Questionnaire Related to the Work Tasks of Physical Therapists

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Physical therapists engage in work tasks that expose them to occupational risk factors related to musculoskeletal disorders. Due to the gap in the literature on instruments focused on those workers, this study adapted a job factors questionnaire to physical therapists, and assessed its psychometric properties. The questionnaire was adapted and its content validity was established. The psychometric properties were evaluated among 142 physical therapists. Reliability was verified using the temporal-stability design and internal consistency. Construct validity was assessed with the known-groups technique. Test–retest results demonstrated intraclass correlation coefficients between .82 and .90 ($p < .001$*). Cronbach's α of .91 verified the reliability of the questionnaire. The known-groups technique demonstrated a statistically significant difference on the scores of the items when physical therapists were compared to office workers. The results indicated that the adapted questionnaire had acceptable psychometric properties for assessing problematic job factors among physical therapists working in hospitals.*

work-related musculoskeletal disorders (WMDs) job factors ergonomics

1. INTRODUCTION

Work-related musculoskeletal disorders (WMDs) include a wide range of inflammatory and degenerative problems concerning the musculoskeletal system. WMDs are often described as among the most important causes of pain and physical disability, affecting millions of workers around the world [1]. Recent studies have identified job factors that may contribute to WMDs among healthcare workers [2, 3]. The job factors and activities indicated by healthcare workers as being related to the appearance or exacerbation of WMDs include handling and transporting patients [4, 5, 6, 7]. There are few studies in the literature on WMDs among physical therapists. It is likely that many health and safety professionals assume that the physical therapists' knowledge

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base of body mechanics, rehabilitation, and injury prevention may be a protective factor for the development of WMDs [8]. However, a recent study involving all healthcare workers from six hospitals demonstrated that nurses and physical therapists were the healthcare professionals most affected by WMDs [4].

Tasks performed by physical therapists often require an overload of the musculoskeletal system combined with repetitive movements of the upper limbs, maintenance of static and dynamic postures for long periods, and movements that stress the spine [9]. The work tasks that may lead to WMDs among physical therapists include lifting and carrying dependent patients, treating a large number of patients in a workday, working in the same posture for long periods, maintaining difficult or restrictive postures, using manual therapy techniques, performing the same task repeatedly, and executing movements involving inclination and rotation of the trunk. Additionally, there is a common complaint about the lack of adequate training on how to avoid injuries during the work activity since sometimes work is carried out even when pain is present [10].

WMDs have had a direct impact on the career of physical therapists and on the quality of service provided [11]. Some physical therapists change either their area of expertise or the techniques used during the job, while others may even change their profession. However, few of those who report WMDs look for help or stay away from their activities for treatment [11, 12, 13, 14, 15, 16].

Although WMDs are common among physical therapists, there are very few published studies related to the job factors that contribute to musculoskeletal symptoms and subsequent disorders. Moreover, there are no instruments available that quantify the occupational challenges encountered by physical therapists during their work. Considering the multidimensional etiology in the development of WMDs, it is important to create policies and actions to reduce the disorders by identifying and abating the risk factors most likely involved [17].

Questionnaires are research tools widely used in epidemiologic studies involving complaints of musculoskeletal discomfort and pain [18, 19, 20]. The lack of validated questionnaires with tested psychometric properties to evaluate WMDs and workplace factors among physical therapists was a research limitation discussed by Carregaro, Trelha, and Mastelan [21].

Due to the need for validated questionnaires for assessing physical therapists' job tasks, the present study adapted an earlier job factors survey to assess perception of the work factors physical therapists believed could lead to job-related pain and discomfort. The previously developed job factors questionnaire (JFQ) had been widely used in epidemiologic and ergonomic intervention studies [10, 19, 22, 23, 24]. The original English-language instrument was culturally adapted for the Brazilian population [25, 26].

Although there are questionnaires that evaluate physical work demands and the occurrence of musculoskeletal symptoms, there is no instrument that assesses those work factors among Brazilian physical therapists. Previous researchers used questionnaires developed by others without first following international guidelines for evaluating the psychometric qualities of the instrument [10, 15, 27, 28].

The purpose of this study was to adapt the JFQ to evaluate physical therapists' perceptions of work-related factors and activities that may contribute to musculoskeletal symptoms and disorders. Additionally, the adapted version of the JFQ was assessed for psychometric properties, specifically reliability and construct validity.

2. MATERIALS AND METHODS

2.1. Adaptation Process of the JFQ for Physical Therapists

The adaptation process began with a literature review of published studies that identified ergonomic risk factors associated with the primary tasks performed by physical therapists [9, 10, 11, 13, 15, 16, 28, 29, 30, 31, 32, 33, 34, 35, 36]. The identification of specific risk factors supported the development and adaptation of the questionnaire items. Thus, the adapted version of the instrument was developed for the content validity process.

A committee of 10 bilingual subject matter specialists (SMSs) evaluated content validity. Each SMS had 10 days to perform an individual assessment, which involved the evaluation of the format, title, instructions, and questionnaire items for clarity, relevance, and comprehensiveness [37, 38]. The SMSs then participated in a meeting to establish the version of the instrument used in the pretest. The percentage agreement score was used to assess the quantitative analysis of the content validity. This analysis was performed by dividing the number of SMSs who agreed by the total number of committee members. Items were considered adequate and no modifications were made when the agreement score was 90% [39, 40]. The SMSs made suggestions for the items that did not fulfill the established agreement level. The SMSs reached a consensus on the final version used in this study.

A pretest was carried out with a sample of 11 physical therapists to assess the understanding of the instrument by the target population. The therapists were individually interviewed regarding their understanding and experience with the questionnaire instrument. None of them recommended any modifications to the questionnaire.

2.2. Participants

The study included 142 physical therapists from a hospital complex associated with a Brazilian public university. They represented the whole population of physical therapists in this hospital. It was established as an inclusion criterion that all participants had to have at least 6 months of professional experience as a physical therapist. No criteria concerning working hours were defined as all physical therapists had the same workday of 6 h. Only participants temporarily not working in the period of data collection were excluded from the study.

2.3. Data Collection

Data were collected under researcher supervision following approval of the hospital superintendent and of each physical therapy department where the participants worked. The university's Institutional Review Board approved the full protocol. All participants provided informed consent. Data were collected during the workday, in a quiet space, at a time chosen by the worker. Each participant completed two questionnaire instruments:

- a sociodemographic and occupational questionnaire, whose purpose was to construct a profile of physical therapists, containing information about gender, age, specialty, the average number of patients treated per week, the average number of hours worked per week, and possible other jobs;
- the JFQ for physical therapists, which was re-administered after 7 days to the same participants, under similar conditions.

The JFQ consisted of 16 questions on work factors that could contribute to musculoskeletal symptoms among physical therapists. The participant indicated the factors that represented a problem on a scale of 0–10 (0—*no problem*, 10—*too much trouble*). The *not applicable* option indicated that a work factor was not one of the participant's job tasks. The items were analyzed individually, allowing verification of the individual's perception about each job factors' contribution to pain or discomfort. The questionnaire items were also evaluated with responses collapsed into three categories: 0–1—*no problem*, 2–7—*minimal-to-moderate problem*, and 8–10—*major problem* [10, 23, 24, 26].

2.4. Psychometric Property Evaluation

2.4.1. Reliability

Reliability was verified using the internal consistency method and the temporal-stability design (test–retest). Cronbach's α was used to analyze internal consistency, and the intraclass correlation coefficient (ICC) was applied to evaluate the test–retest stability [41, 42]. The test–retest involved re-administering the JFQ to the same physical therapists 7 days after the first administration. Similar results were expected [41, 43, 44].

2.4.2. Validity

Construct validity was assessed with the known-groups technique by comparing the results of the JFQ among physical therapists with the results obtained among 40 office workers. Differences in results obtained between these worker groups would demonstrate that they performed different occupational activities [43, 45]. Some items of the questionnaire were not included in the questionnaire for the office workers since they were specific to treating patients.

The Mann–Whitney test was used to assess construct validity because data had a non-normal distribution. The level of significance adopted for statistical significance was $p < .05$ [46, 47, 48].

3. RESULTS

The content adaptation process of the JFQ involved developing the measuring instrument, evaluating content validity, and pretesting the instrument. Eight items of the initial 17-item questionnaire achieved a percentage agreement score greater than or equal to 90%.The SMSs suggested modifying the 8 items with under-90% agreement, modifying the instructions, and changing the title of the instrument. The questionnaire decreased from 17 to 16 items after item 16 was merged with item 3. The *not applicable* option was added to the scale to indicate when the activity was not part of a physical therapist's work.

A sample of 11 physical therapists participated in the pretest phase. They were 9 women and 3 men with a mean age of 26 years (*SD* 3.7) and a mean time of work of 3.4 years (*SD* 3.7). All 11 therapists agreed on the relevancy and clarity of the questionnaire items. However, they suggested that the instruction explain that the participants should consider their main workplace as it related to each questionnaire item. This was a helpful suggestion because most physical therapists worked at more than one location and the ergonomic risks could differ from one work environment to another.

From the 142 physical therapists participating in this study, 116 were women (81.6%) and 26 were men (18.3%). The mean age of this population was 26.8 years (*SD* 7.0) and the mean time of work was 3.6 years (*SD* 7.4). The distribution of the participants by specialty was 18.3% in neurology, 23.9% in orthopedics, 26.0% in the intensive care unit, 15.4% in the cardiorespiratory area, 0.7% in dermatology, 0.7% in general physical therapy, and 14.7% in other specialties, such as physical therapy applied to women's health and neonatology.

The physical therapists worked an average of 31.9 h per week (*SD* 7.7) and they treated 9.2 patients per day (*SD* 5.3). Furthermore, 28.8% of them reported having a second job. The results demonstrated that working in the same posture for long periods and continuing to work when injured or hurt were the two factors most complained about, followed by working in awkward or cramped postures, treating too many patients per day, and bending or twisting the back in an awkward way. Table 1 summarizes these results.

Reliability was established with the test–retest temporal stability and the assessment of internal consistency. Agreement between the test and the retest was good, with ICC values ranging from .82 to .90 (Table 2). Four questionnaire items had ICCs of .90 (working near or at your physical limits; continuing to work while injured or hurt; carrying, lifting, or moving heavy materials or equipment; and carrying, lifting, or moving patients).

The internal consistency of the instrument was evaluated with Cronbach's α. The results indicated internal consistency for both groups: $\alpha = .91$ for physical therapists and $\alpha = .87$ for office workers. Questionnaire items 4 and 14 were not analyzed in the group of office workers since they were specifically related to patient treatment (Table 3).

Construct validity for the questionnaire instrument was evaluated using the known-groups technique by comparing the group of physical therapists to the group of office workers. The latter was composed of 40 workers, 14 women (35%) and 26 men (65%), with a mean age of 28.1 years (*SD* 7.4) and a mean time of work of 3.8 years (*SD* 3.6). There was a significant differ-

ence between the groups on most questionnaire items, with the exception of items 3, 15, and 16 (Table 4). Items 4 and 14 were not considered during the evaluation of construct validity because they pertained specifically to patients.

TABLE 1. Physical Therapists' Scores on Items of the Job Factors Questionnaire

	Work-Related Activitiy or Job Factor	*N*	*M*	*SD*	*Mdn*
1	Performing the same task over and over (mobilizations, manipulations, etc.)	140	4.9	2.5	5
2	Working very fast for short periods	132	4.0	3.0	4
3	Holding or handling objects (shape, weight, vibration, etc.)	134	3.3	2.5	3
4	Treating too many patients per day	134	5.8	2.7	6
5	Insufficient breaks or pauses during the workday	140	5.7	2.8	6
6	Working in awkward or cramped postures	137	6.4	2.9	7
7	Working in the same posture for long periods (standing, bending over, sitting, kneeling, etc.)	140	6.9	2.7	8
8	Bending or twisting your back in an awkward way	139	5.8	3.1	7
9	Working near or at your physical limits	134	5.4	3.3	6
10	Reaching or working over your head or away from your body	125	4.8	3.2	5
11	Working on an inadequate environment (noise, temperature, luminance, etc.)	134	4.9	3.0	5
12	Continuing to work when injured or hurt	140	6.9	2.9	8
13	Carrying, lifting, or moving heavy materials or equipment	125	4.8	3.2	5
14	Carrying, lifting, or moving patients	138	5.0	3.1	5
15	Work scheduling (overtime, length of workday)	135	4.4	3.1	5
16	Lack of specific training for self-injury and musculoskeletal symptom prevention	129	4.7	3.1	5

TABLE 2. Agreement Scores of Test–Retest for Each Item and Its Confidence Interval (CI)

	Work-Related Activitiy or Job Factor	ICC	95% CI
1	Performing the same task over and over (mobilizations, manipulations, etc.)	.83	0.78, 0.88
2	Working very fast for short periods	.85	0.80, 0.89
3	Holding or handling objects (shape, weight, vibration, etc.)	.87	0.82, 0.90
4	Treating too many patients per day	.87	0.82, 0.91
5	Insufficient breaks or pauses during the workday	.85	0.79, 0.88
6	Working in awkward or cramped postures	.86	0.81, 0.90
7	Working in the same posture for long periods (standing, bending over, sitting, kneeling, etc.)	.84	0.78, 0.88
8	Bending or twisting your back in an awkward way	.82	0.75, 0.87
9	Working near or at your physical limits	.90	0.86, 0.92
10	Reaching or working over your head or away from your body	.88	0.84, 0.91
11	Working on an inadequate environment (noise, temperature, luminance, etc.)	.85	0.79, 0.89
12	Continuing to work when injured or hurt	.90	0.86, 0.92
13	Carrying, lifting, or moving heavy materials or equipment	.90	0.86, 0.93
14	Carrying, lifting, or moving patients	.90	0.83, 0.91
15	Work scheduling (overtime, length of workday)	.82	0.76, 0.87
16	Lack of specific training for self-injury and musculoskeletal symptom prevention	.85	0.78, 0.88

Notes. ICC—intraclass correlation coefficient.

TABLE 3. Cronbach's α of the Adapted Version of the Job Factors Questionnaire Administered to Physical Therapists (PT) and Office Workers (OW)

		α	
Work-Related Activitiy or Job Factor		**PT**	**OW**
1	Performing the same task over and over (mobilizations, manipulations, etc.)	.91	.86
2	Working very fast for short periods	.92	.87
3	Holding or handling objects (shape, weight, vibration, etc.)	.91	.88
4	Treating too many patients per day	.91	*
5	Insufficient breaks or pauses during the workday	.91	.87
6	Working in awkward or cramped postures	.91	.87
7	Working in the same posture for long periods (standing, bending over, sitting, kneeling, etc.)	.91	.87
8	Bending or twisting your back in an awkward way	.91	.86
9	Working near or at your physical limits	.91	.88
10	Reaching or working over your head or away from your body	.91	.88
11	Working on an inadequate environment (noise, temperature, luminance, etc.)	.91	.86
12	Continuing to work when injured or hurt	.91	.85
13	Carrying, lifting, or moving heavy materials or equipment	.91	.86
14	Carrying, lifting, or moving patients	.91	*
15	Work scheduling (overtime, length of workday)	.91	.86
16	Lack of specific training for self-injury and musculoskeletal symptom prevention	.91	.85
	total instrument	.91	.87

Notes. *—items not related to office workers' tasks.

TABLE 4. Means and Medians of the Responses of the Physical Therapists and Office Workers to the Job Factors Questionnaire

		Physical Therapists			**Office Workers**			
Work-Related Activitiy or Job Factor		***M* (*SD*)**	***Mdn***	**IQR**	***M* (*SD*)**	***Mdn***	**IQR**	***p****
1	Performing the same task over and over (mobilizations, manipulations, etc.)	4.9 (2.5)	5	4	3.2 (2.3)	4	4	.0004
2	Working very fast for short periods	4.0 (3.0)	4	6	1.8 (1.9)	2	3	.0005
3	Holding or handling objects (shape, weight, vibration, etc.)	3.3 (2.5)	3	4	3.1 (2.8)	3	5	.5524
4	Treating too many patients per day							
5	Insufficient breaks or pauses during the workday	5.7 (2.8)	6	4	2.8 (2.5)	2	4	<.0001
6	Working in awkward or cramped postures	6.4 (2.9)	7	4	3.2 (3.2)	2	5	<.0001
7	Working in the same posture for long periods (standing, bending over, sitting, kneeling, etc.)	6.9 (2.7)	8	4	4.3 (3.1)	4	5	<.0001
8	Bending or twisting your back in an awkward way	5.8 (3.1)	7	5	2.2 (2.3)	1	3	<.0001
9	Working near or at your physical limits	5.4 (3.3)	6	6	2.1 (2.0)	2	2	<.0001
10	Reaching or working over your head or away from your body	4.8 (3.2)	5	6	2.3 (2.9)	1	2	.0006
11	Working on an inadequate environment (noise, temperature, luminance, etc.)	4.9 (3.0)	5	6	3.3 (2.6)	3	4	.0099
12	Continuing to work when injured or hurt	6.9 (2.9)	8	4	3.4 (2.9)	3	4	<.0001
13	Carrying, lifting, or moving heavy materials or equipment	4.8 (3.2)	5	6	2.0 (1.9)	1	3	<.0001
14	Carrying, lifting, or moving patients							
15	Work scheduling (overtime, length of workday)	4.3 (3.1)	5	6	3.5 (3.0)	3	4	.1883
16	Lacking specific training for self-injury and musculoskeletal symptom prevention	4.6 (3.1)	5	5	4.7 (3.3)	4	6	.9172

Notes. IQR—quartile; items 4 and 14 were not considered in the group of office workers; *—*p* from the Mann–Whitney test.

4. DISCUSSION

The purpose of this study was to adapt the JFQ for physical therapy tasks, and to evaluate the psychometric properties of the instrument. The process of developing, adapting, analyzing, and disseminating instruments that evaluate workers' health and work tasks is not new [49, 50, 51]. However, when a questionnaire or a scale is developed and used to measure workers' perception of work tasks and activities, it is also necessary to demonstrate reliability and validity of the instrument to avoid doubts concerning the accuracy of the collected data [52].

Fagarasanu and Kumar recommend performing a literature search for questionnaires that may be suitable for the study design and study population before starting the development of new instruments [53]. Others recommend choosing validated instruments and those, if necessary, that can be adapted to the population sample of interest [37]. Snyder, Watson, Jackson, et al. suggest that instruments developed for the general population can often be used for other occupational groups if the appropriate adaptations or modifications are made [54]. Modifying and employing existing instruments allows a better comparison between studies relative to the comparison of results from unique instruments.

The original JFQ was used in other epidemiologic research and ergonomic intervention studies. The psychometric properties of its adapted versions were evaluated in several occupational groups [22, 23, 24, 25, 26, 55, 56]. In the adaptation process the investigators of this study followed internationally recommended guidelines during instrument content adaptation: a wide literature review, the development and adaptation of the items, revision by an expert committee, and a pretest [38, 39, 40].

A committee of SMSs revised the adapted questionnaire. This was a critical step in the content validity process because it assisted in determining the representativeness and relevance of each item [57]. The literature recommends a minimum of 5 SMSs with significant experience in the area of physical therapy [40, 58, 59]. The SMSs in this study received the material needed to conduct the content evaluation of the questionnaire [38].

The percentage agreement score was used to assess content validity [39]. Specific instrument items were considered appropriate for inclusion if the percentage agreement score was over 90%. Items reaching the 90% threshold were modified using SMSs' suggestions. This quantitative analysis provided more consistency to the content validity process, making it easier to complete [40, 57, 59].

The study had 142 participants. Most physical therapists were female (81.6%). This high participation rate among women reflected the proportion of females in the target population and, like in other studies involving physical therapists, it also showed a predominance of women among this professional group [10, 27, 33]. The mean age (27 years) of the participants was lower than reported in other studies among physical therapists [28, 29]. This can probably be explained by the fact that the data had been collected in a hospital associated within a university, where some participants were engaged in academic improvement.

The job factors perceived to contribute the most to musculoskeletal symptoms included working in the same posture for long periods (standing, bending over, sitting, kneeling, etc.), continuing to work when injured or hurt, working in awkward or cramped postures, and treating too many patients per day. This finding suggests that physical therapists perceive work activities involving physical exertion are the most problematic factors. This finding is consistent with other studies of physical therapists [11, 14, 15, 27, 29]. This result can be explained by the specific characteristics of the physical therapists' tasks.

Regarding the instrument reliability, ICC was evaluated for each item. ICCs ranged from .82 to .90 with a 7-day interval between test and retest. ICCs in this range are considered as excellent agreement [44]. The authors of the original version of the questionnaire used different intervals (14, 27, and 33 days) between the tests, κ values from .46 to .68, showing no difference related to the time interval [19]. However, Goldsheyder, Weiner, Nordin, et al. achieved a better

agreement between test and retest using the same instrument within the 7-day interval, $\kappa = .80$ [23]. The authors of the Brazilian-Portuguese version also used a 7-day interval between test and retest, with ICC ranging from .54 to .73 [26].

Picking the optimal time interval for test–retest reliability is not well established in the literature. Too short intervals can affect the analysis because of the memory influence concerning the previous answers. On the other hand, long periods between test and retest may result in changes in the work environment or work conditions that would influence the ICC [52]. For this reason, a 7-day time interval was chosen.

Working near or at your physical limits; continuing to work when injured or hurt; carrying, lifting, or moving heavy materials or equipment; and carrying, lifting, or moving patients showed the highest values (ICC .90). These conditions were related to job factors involving postural aspects and physical demand. This finding is similar to that with the Brazilian-Portuguese version of the questionnaire, which also demonstrated a good agreement on items related to physical effort among workers from metallurgic industries [26].

Internal consistency is an important method of estimating scale reliability demonstrating the association between the items of an instrument [52]. An evaluation of reliability showed $\alpha = .91$ for physical therapists and $\alpha = .87$ for office workers.

The assessment of construct validity using the known-groups technique included a comparison of physical therapists and office workers. A high degree of construct validity is obtained when the scores of dissimilar groups are very different on items that have high relevance to one group but not the other [45]. The results in this study demonstrated that most items of the adapted questionnaire were different between the groups. However, holding or handling objects, work scheduling, and lack of specific training for self-injury and musculoskeletal symptoms prevention obtained similar scores in both groups. This finding was expected as those three activities are common to both professions. The questionnaire items related to physical demands confirmed the expected results, since office workers primarily perform their activities sitting and they involve typing or writing. Physical therapists, however, perform dynamic activities using large muscle groups. These activities often involve moving and repositioning patients; providing resistive exercise to patients' limbs; and hand-intensive tasks such as soft tissue massage, mobilization of joints, and connective tissue manipulation. Coluci, Alexandre, and Rosecrance used the known-groups evaluation, demonstrating the instrument validity with significant difference on 10 of the 15 items between a group of production workers from metallurgic industries and a group of office workers [26].

The data showed that the adapted version of the JFQ related to the work tasks of physical therapists may be an important instrument for assessing risks for WMDs in the physical therapists' workplace, because it allows a quick investigation of the work factors that these workers themselves perceive as a problem.

It is important that the JFQ related to physical therapists' work tasks is a subjective measure and should be used with objective tools during an ergonomic intervention to ensure greater accuracy of the measurement. Since this research was made with physical therapists from a public university, future studies should be conducted with therapists in different environments and work conditions.

5. CONCLUSIONS

The results showed that the adaptation of the JFQ related to the work tasks of physical therapists achieved good results in the evaluation of its psychometric properties. The test–retest reliability indicated a very good agreement between the items of the instrument with ICC from .82 to .90. Cronbach's α of .91 for physical therapists and .87 for office workers, evidenced the internal consistency of the adapted version. Construct validity using the known-group technique demonstrated a significant difference between the groups. The JFQ can be reliably used in this population.

This research was conducted with physical therapists from a hospital complex. It would be interesting to use the questionnaire in physical therapists in different situations, e.g., privately employed and self-employed, working a part- and full-time workday. These findings could be compared and analyzed in future studies.

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