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Cross-cultural Adaptation, Reliability, and Validity of the Work Role Functioning Questionnaire to Brazilian Portuguese

Cristiane Helena Gallasch · Neusa Maria Costa Alexandre · Benjamin Amick III

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Abstract *Introduction* The study objectives were to translate and adapt the Work Role Functioning Questionnaire (WRFQ) into the Brazilian Portuguese language and evaluate its reliability in patients experiencing musculoskeletal disorders. *Methods* The cross-cultural adaptation was performed according to the internationally recommended methodology, using the following guidelines: translation, back-translation, revision by a committee, and pretest. At first, the questionnaire was independently translated by two bilingual translators, who had Portuguese as their mother language. Subsequently, two other translators whose mother language was English did the back-translation. A committee composed of five specialists revised and compared the translations obtained, developing the final version for pretest application. The pretest was carried out with 30 patients experiencing musculoskeletal disorders. Psychometric properties were evaluated by administering the questionnaire to 105 subjects with musculoskeletal disorders and receiving physical therapy treatment. The reliability was estimated through stability and homogeneity assessment. The construct validity was tested comparing subjects experiencing musculoskeletal disorders to healthy workers. *Results* The results indicated good content validity and internal consistency (Cronbach alpha = 0.95). Cronbach alpha for each scale was >0.85, except for the social demand scale. The Intraclass Correlation Coefficient for the test–retest reliability was satisfactory for mental demands (ICC = 0.68) and excellent for the others (0.82–0.91). In relation to the construct validity, the

C. H. Gallasch (✉) · N. M. C. Alexandre
Department of Nursing, Faculty of Medical Sciences, State University of Campinas (UNICAMP),
R. Marques de Abrantes, 1362, Campinas, São Paulo 13080-220, Brazil
e-mail: cristiane_gallasch@yahoo.com.br

N. M. C. Alexandre
e-mail: neusalex@fcm.unicamp.br

B. Amick III
Institute of Work and Health, Toronto, ON, Canada M5G 2E9
e-mail: Benjamin.C.Amick@uth.tmc.edu

B. Amick III
Behavioral Sciences and Epidemiology, School of Public Health, University of Texas,
1200 Herman Pressler, E 1015, Houston, TX 77225, USA

mean score obtained for each scale was lower for physical, work scheduling, and output demands in the subjects with musculoskeletal disorders. There was a significant difference ($p < 0.001$) between the groups in comparison to work scheduling, physical, and output demands. *Conclusions* The data showed that the cross-cultural adaptation process was successful and the adapted instrument demonstrated psychometric properties making it reliable to use in Brazilian culture.

Keywords Ergonomics · Occupational health nursing · Musculoskeletal diseases · Work capacity evaluation · Cross-cultural comparison

Introduction

Evaluation instruments to measure the efficacy of the worker on his/her return to work have been developed, but many of these instruments focus on isolated measurements and fail to take all the necessary factors into consideration. Examples include instruments that deal only with time until return to work and duration of functional incapacity, or instruments that evaluate only the economic impact of absenteeism or sick leave [1]. Instruments are required for: (a) the evaluation of the more operational aspects of functionality testing that would be capable of supplying important information on the extent to which impairments exist in individuals experiencing musculoskeletal symptoms [2], (b) evaluate all the factors involved together, supplying accurate information on the health status of the worker prior to his/her return to the workplace, (c) that would be culturally adapted to the environment of the population to be evaluated.

The "Work Role Functioning Questionnaire" (WRFQ) was developed based on the "Work Limitations Questionnaire" (WLQ) and "Work Limitations-26 Items" or WL-26 [3]. The objective is to evaluate individual changes resulting from health problems related to chronic disorders, impacting, or limiting his/her daily work activities [3–5]. The WRFQ is also capable of assessing whether the worker has changed following treatment of the musculoskeletal disorders, and permits evaluation of the proposed clinical treatment [3]. The five sub-scales evaluated by the WRFQ are showed in Fig. 1.

Constant efforts have been made by health professionals to evaluate the health conditions of populations using international parameters. In order to do so, instruments for the evaluation of health conditions based on the international literature are translated, adapted, and validated. In order to translate and adapt an instrument, the investigator must bear in mind the cultural differences in the perception of health and disease of the population in which the instrument will be used, in order to subsequently validate it [6].

Therefore, the objective of the present study was to culturally adapt the "Work Role Functioning Questionnaire" (WRFQ) to Brazilian Portuguese and to evaluate the validity and reliability of the Brazilian version.

Methods

In the present study, the essential methodological steps recommended by internationally recognized publications for the procedures involved in the cultural adaptation of measurement instruments were followed [6–11].

Work scheduling demands (5)

1. Work the required number of hours
2. Getting going easily at the beginning of the workday
3. Start on your job as soon as you arrived at work
4. Do your work without stopping to take extra breaks or rests
5. Stick to a routine or schedule

Physical Demands (6)

13. Walk or move around different work locations (for example, go to meetings)
14. Lift, carry, or move objects at work weighing more than 10 pounds
15. Sit, stand, or stay in one position for longer than 15 minutes while working
16. Repeat the same motions over again while working
17. Bend, twist or reach while working
18. Use hand-held tools or equipment (for example, a phone, pen, keyboard, computer mouse, drill, hairdryer or sander)

Mental demands (6)

19. Keep your mind on your work
20. Think clearly when working
21. Do work carefully
22. Concentrate on your work
23. Work without losing your train of though
24. Easily read or use your eyes when working

Social demands (3)

25. Speak with people in-person, in meeting or on the phone
26. Control your temper around people when working
27. Help other people to get work done

Output demands (7)

6. Handle the workload
7. Work fast enough
8. Finish work on time
9. Do your work without making mistakes
10. Satisfy the people who judge your work
11. Feel a sense of accomplishment in your work
12. Feel you have done what you are capable of doing

Fig. 1 WRFQ's sub-scales

Cross-cultural Adaptation

Forward Translation

The questionnaire and the instructions for its completion were initially translated into Portuguese by two independent Brazilian translators. One of the translators was aware of the objectives and concepts involved in this instrument and had previous experience in translating technical medical texts. The other translator performed the translation without any prior knowledge of its objective, as recommended in the international literature [6, 7]. The results obtained were compared by the translators and by one of the investigators until a consensus was reached [6].

Back-translation

The synthesis of the final version in Portuguese was back-translated into English by two bilingual, native English-speaking translators [6, 7, 10]. These translators received no information on the concepts and purposes of the instrument and had no academic training in the healthcare field [6, 7].

Expert Committee

A multidisciplinary committee, composed of five bilingual professionals [11, 12], an engineer working in occupational health, a physician with experience in the field of occupational health, a physiotherapist, a nurse working in research in the area of translation and cross-cultural adaptation, and a linguist, reviewed and compared the final Portuguese translation and the back-translations to obtain a final version [7, 9].

The guidelines for completing the instrument and the topics of each section were reviewed and evaluated, taking into consideration the semantic, idiomatic and cultural equivalents and the clarity of the text in order to guarantee comprehension and cultural equivalence in the final version [10].

For the review committee stage of validation, an instrument was created and given to the committee members two weeks prior to a previously scheduled meeting. This allowed the judges to study all the versions of the WRFQ and to reflect individually on each statement or question prior to the meeting.

Pretesting

In order to evaluate the equivalence of the questionnaire within the Brazilian cultural environment, to identify errors in the final version and to confirm that the questions and statements were comprehensible, a pretest was carried out in a sample of 30 patients [6, 10] with musculoskeletal disorders receiving treatment at a Physiotherapy Department in the health center of a State University.

A revision of the questions would have been considered if 15% of the participants had difficulty in understanding or completing the questionnaire [13].

Evaluation of the Psychometric Properties of the Translated Version

Content Validity

The content quality of the Brazilian Portuguese WRFQ was evaluated by the experts committee throughout the cross-cultural adaptation process and through qualitative analyses of the comments expressed by the pretesting participants.

Reliability

In the present study, reliability was evaluated by measuring internal consistency and stability (test–retest reliability).

Construct Validity

In order to establish whether the Brazilian version of the WRFQ really measured what it was projected to measure, the construct validity was evaluated using the known-groups validity technique, i.e., by differentiating between workers with and without musculoskeletal disorders. The differences were, therefore, expected between the groups and this would be reflected in their scores [14, 15].

Subjects and Setting

One hundred and five individuals with chronic musculoskeletal complaints and 105 individuals with no complaints were selected to participate [8]. Inclusion criteria for the symptomatic individuals comprised literate patients aged 18–65, with musculoskeletal symptoms, undergoing treatment in a physiotherapy clinic at the healthcare center of a state university, who had been referred there with a medical report of chronic musculoskeletal disorders, who were in formal or informal employment, with a weekly workload of 10 hours or more, as proposed by Durand et al. [3] during the validation process of the Canadian version of the WRFQ. Exclusion criteria comprised participants with other incapacitating diseases, illiterate patients or those with some degree of difficulty in reading and understanding. In addition, those individuals who selected the response "Does not apply to my job" for more than 20% of the questions in at least one sub-scale evaluated by the WRFQ were excluded.

The workers with no musculoskeletal complaints were selected from employees at a technology development center in the state of São Paulo. Individuals who spontaneously agreed to participate in the study, who denied having any difficulty in carrying out their work-related duties, who stated that they had no musculoskeletal symptoms or any other incapacitating disorders and who had no past history of musculoskeletal disorders or absenteeism registered in the healthcare outpatients' department of that center were included.

Data Collection

During data collection, subjects completed the Brazilian version of the self-report WRFQ. With respect to the test–retest reliability analysis, i.e., the data related to the individuals who had been referred by their doctor because of chronic musculoskeletal disorders, data was collected during the first stage (test) at the Physiotherapy Department and, two days later, when the individual returned to the Physiotherapy Department or at their workplace (retest), according to where the individual was located.

Data on the construct validity evaluation were collected at the place of employment in the case of individuals with no symptoms (a technology development center in the state of São Paulo).

Instruments

Some questions defined in a file were asked to provide the population's characteristics.

The Brazilian version of the WRFQ was evaluated in its five sub-scales. Questionnaires were included in analysis only if had, in each sub-scale, no more than 20% of its questions answered like "does not apply to my job".

Answers could be: 0—difficult all the time, 1—difficult most of the time, 3—difficult some of the time, and 4—difficult none of the time. So, all items of the same sub-scale had their scores added, and than divided by the number of questions. The multiply of this value by 25 resulted in percentages, between 0 and 100, being 0% the same that difficult all the time, and 100% equivalent to difficult none of the time.

Statistical Analyses

Initially, a descriptive analysis was carried out to characterize the participants. Data collected were entered into a data bank (SPSS for Windows, version 7.5) and submitted to statistical analysis with the collaboration of the University's Statistics Department.

Internal consistency was confirmed by Cronbach's coefficient alpha [1, 3, 14]. A value >0.70 for Cronbach's alpha was defined as satisfactory internal consistency [16]. Each question was evaluated in relation to the instrument as a whole and in relation to the domain of task demand to which it belonged.

The stability was evaluated using the test–retest reliability method. The data obtained were submitted to statistical analysis using the Intraclass Correlation Coefficient (ICC) to evaluate the reliability of all the scales studied. The interpretation of the ICC values was based on the definitions proposed by Fleiss [17].

As results of pretesting and the data collection didn't demonstrate a normal distribution, the Mann–Whitney test was used to evaluate the data related to the validity.

After that, analyses of variance were conducted to determine if the data were significantly different across the two groups related to the WRFQ.

The computer software programs "The SAS System for Windows" (Statistical analysis system), version 8.02, SAS Institute, Inc., 1999–2001, Cary, NC, USA; and "SPSS for Windows" (Statistical package for the social sciences), version 10.0.7, SPSS Inc., 1989–1999, Chicago, IL, USA were used throughout the entire statistical analysis.

Ethical Considerations

The full protocol was approved by the University's Research Ethics Committee. All subjects participating in the study were asked to provide informed consent.

Results

Cross-cultural Adaptation Process

During the procedures of translation, back-translation and submission of the instrument to the review committee, no need was found to alter the meaning of the questions or to remove or add sentences.

During the development of the pretest, a direct interview was carried out with the subjects to evaluate difficulties in completing the questionnaire and to identify any questions or words that may have been difficult to understand.

The individuals interviewed during this stage reported no difficulties in understanding the content of each question, but around 25% reported difficulties each time they answered a new question in remembering that the statement referred to their difficulty in carrying out certain activities. Following further discussion with the review committee the expression "difficulty in" was included in each statement and was not considered redundant but, rather, essential to guarantee that the Brazilian version of the WRFQ would be capable of performing accurate evaluations. Moreover, changes were made to the presentation of the instrument, and consisted of the monochromatic presentation of questions to ensure that no emphasis was placed on any particular expression; in the heading of the questions on the second page to facilitate reading and in the association of each score with the corresponding answer.

Description of the Sample

During the stage of evaluation of the validity and reliability of the instrument in question, 105 patients from the University's Physiotherapy Department, who had chronic musculoskeletal disorders confirmed by medical diagnosis participated in the study. One hundred and five subjects with no musculoskeletal complaints were selected from employees at a technology development center. The sociodemographic characteristics of the subjects are described in Table 1. Labor functions were classified according to Hébert's classification [18].

The mean WRFQ in Brazilian version scores with respect to each domain is shown in Table 2. Lower WRFQ values were found with respect to physical demands in the group of workers with musculoskeletal disorders. Values related to social and mental demands represented the highest scores in both groups.

Table 1 Sociodemographic characteristics (n = 210)

	Workers with chronic musculoskeletal complaints (n = 105)	Workers with no chronic musculoskeletal complaints (n = 105)
Gender n(%)		
Male	45 (42.9)	46 (43.8)
Female	60 (57.1)	59 (56.2)
Mean age (years (s.d.))	39.45 (11.15)	34.83 (11.76)
Mean weekly work hours (s.d.)	37.39 (8.12)	40.61 (2.51)
Site of musculoskeletal disorders (%)		
Upper extremity	4.76	
Neck	13.33	
Back	23.81	
Lower extremity	30.48	
More than one	27.62	
Job Type n(%)*		
Manual	18 (17.14)	14 (13.34)
Mixed	49 (46.67)	65 (61.90)
Non-Manual	38 (36.19)	26 (24.76)

* Classified according to Hébert, 1996 [18]

Table 2 Description of the mean score of the WRFQ (Brazilian Portuguese version) administered to workers with chronic musculoskeletal complaints (n = 105) and workers with no chronic musculoskeletal complaints (n = 105)

	Workers with chronic musculoskeletal complaints	Workers with no chronic musculoskeletal complaints	p[a]
Work scheduling demands	70.3 (±24.1)	89.2 (±12.5)	0.0001
Output demands	71.4 (±23.7)	83.8 (±14.9)	0.0001
Physical demands	60.3 (±25.5)	87.7 (±11.3)	0.0001
Mental demands	86.2 (±18.3)	86.1 (±13.7)	0.3879
Social demands	90.9 (±14.4)	90.9 (±9.8)	0.5604

[a] Mann–Whitney test

Evaluation of the Psychometric Properties of the Translated Version

Reliability-Homogeneity (Internal Consistency)

The instrument was found to have a high internal consistency (Cronbach's coefficient alpha = 0.95). In the evaluation of each sub-scale, greater consistency was found for mental demand (0.93) and lesser precision for social demand (0.57). The values obtained are shown in Table 3.

Stability (Test–Retest)

Test–retest reliability was satisfactory with respect to mental demands and excellent for the other domains, as described in Table 4. The best index was obtained for the domain that evaluated production demand (ICC = 0.91).

Table 3 Cronbach's alpha coefficient for each WRFQ sub-scale (Brazilian Portuguese version)

	Number of items	Cronbach's alpha
Work scheduling demands	5	0.88
Physical demands	6	0.86
Mental demands	6	0.93
Social demands	3	0.57
Output demands	7	0.89

Table 4 Test–retest reliability scores of the WRFQ (Brazilian Portuguese version)

	Number of items	R	CI 95%
Work scheduling demands	5	0.90	0.86–0.93
Physical demands	6	0.88	0.83–0.91
Mental demands	6	0.68	0.56–0.77
Social demands	3	0.82	0.75–0.88
Output demands	7	0.91	0.87–0.93

Validity

The evaluation of construct validity was carried out by comparing the groups of workers with and without musculoskeletal symptoms, as shown in Table 2. A significant difference was found between the groups with respect to work scheduling, physical, and output demands. There was no statistically significant difference with respect to mental and social demands.

Analyses of Variance

The analyses of variance conducted demonstrated difference between the two groups only regarding to the output demand related to the group versus job type (Table 5). This isolated result probably didn't interfere with the analyses of the WRFQ.

Discussion

The objective of this study was to adapt the "Work Role Functioning Questionnaire" permitting its application for the evaluation of proposed clinical treatments and for assessment of the performance of affected employees prior to and following rehabilitation. Its application may also be useful in guiding the adaptations required to facilitate the employee's return to work.

The changes made in the questionnaire were introduced to facilitate comprehension and the association of responses. All changes were submitted once again to the specialist committee [10].

The participants undergoing treatment at the University's Physiotherapy Department worked an average of 37.4 hours/week and were predominantly employed to carry out a combination of work tasks (46.67%), i.e., a job that entailed the intermittent manipulation of heavy cargo or the continuous manipulation of light cargo, as well as, having to remain for periods of time in a static position [18].

There was a predominance of complaints related to the lower limbs, followed by complaints referring to more than one location and dorsal/low back complaints (30.48%, 27.62% and 23.81%, respectively). However, when complaints related to the dorsal/low back regions and those referring to more than one location were analyzed, it was found that 32.38% of individuals had complaints of back pain. Back pain is the principal cause of incapacity in industrialized countries, and is common both inside and outside the work environment [19].

Table 5 Analyses of variance between the groups and sociodemographic parameters

Parameter	*p* value				
	Work scheduling demand	Physical demand	Mental demand	Social demand	Output demand
Mean Age	0.0551	0.9615	0.4184	0.9481	0.5800
Mean weekly work hours	0.3385	0.4594	0.4577	0.7391	0.4587
Job type	0.2463	0.5550	0.0523	0.6484	0.7268
Group	0.3418	0.7483	0.8936	0.4787	0.2010
Mean Age * Group	0.2570	0.5237	0.5996	0.5111	0.6206
Mean weekly work hours * Group	0.5287	0.4945	0.8950	0.5207	0.4302
Job Type * Group	0.2363	0.4497	0.8984	0.9023	0.0464

* Comparison between groups

Evaluation of the workers revealed lower values for the patients with symptoms who were undergoing physiotherapy compared to the symptomless individuals with respect to the physical domain (means of 60.26 and 87.74, respectively). The physical demand measures the ability of the worker to carry out work-related activities, including physical, dynamic, and static loads such as lifting heavy objects, movements, resistance, coordination, and flexibility.

Picavet and Hoeymans [20] related a decline in the quality of life of individuals with musculoskeletal disorders, related principally to pain, reduced functionality and physical mobility, and to limitations in carrying out daily activities. Roux et al. [21] showed that, when MSDs are present, the physical domain is predominantly affected, although there are also changes in the mental and social domains.

The values achieved for social and mental demands were the highest scores obtained, both in the group of individuals with musculoskeletal complaints (86.2 and 90.9, respectively), and in the group of symptomless individuals (86.1 and 90.9, respectively). Data suggest that the participants with complaints did not score poorly in the evaluation of social and mental demands because their musculoskeletal disorders were not severe and did not oblige them to miss work.

In the evaluation of the psychometric properties, high values of internal consistency were observed. All sub-scales excepted the social demand sub-scales had similar high internal consistency. During the process of cultural adaptation of the same instrument for the Canadian French, a lower value (0.66) was also found for social demand; however, Cronbach's alpha was >0.80 for all the other sub-scales [3]. During the validation process of the WL-26, the questionnaire that preceded the WRFQ, Cronbach's alpha values between 0.88 and 0.92 were obtained for sick individuals and those with occupational lesions in the United States; however, only four sub-scales were evaluated [1].

The test–retest reliability technique indicated satisfactory reliability for mental demand ($R = 0.68$) and excellent reliability for all the other sub-scales (0.82–0.91). Mental demand includes the cognitive requirements related to attention and concentration. Work-related stress, included in the mental sub-scale, is an important factor that has a significant effect on reports of pain and discomfort [22].

The evaluation of construct validity showed a statistically significant difference between the groups for scheduling demands, physical demands, and output demands. There was no statistically significant difference for either mental or social demands. This result was expected since individuals with musculoskeletal disorders have a greater incidence of physical limitations, as well as, limitations in work planning and production.

Durand et al. [3] found similar results in the adaptation process of the WRFQ for the Canadian French. These data confirm the construct validity of the instrument in question, which succeeded in showing the differences between the aforementioned groups.

The findings suggest that this instrument may be used to improve evaluation of the health conditions of workers, to assess the effectiveness of proposed clinical therapies, to identify any adaptations required to provide an adequate work environment and to plan and implement an effective rehabilitation program in occupational health.

Conclusion

The Brazilian version of the WRFQ achieved good results with respect to the evaluation of its psychometric properties, and was considered reliable for use in the Brazilian population and in individuals with musculoskeletal disorders.

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