DEVELOPMENT OF A QUESTIONNAIRE TO EVALUATE THE
USABILITY OF ASSESSMENT INSTRUMENTS

INTRODUCTION

Brazilian workers have shown high occurrence of work-related musculoskeletal disorders\(^1\). These disorders include a large number of inflammatory and degenerative conditions\(^2\). There are various job factors that may contribute to the development of such disorders, such as static work, repetitiveness, forceful exertions, vibration, organizational and psychosocial factors\(^3-5\). These data show the importance of studies about work-related risk factors, aiming to prevent the appearance of pain and/or injury\(^6\).

Questionnaires are important strategies to assess the prevalence and incidence of these symptoms and work factors\(^7\). The instrument Job

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Factors Questionnaire was originally developed by Rosecrance et al. in the United States, in 1993, and its psychometric properties were published in 2002.

The aim of this questionnaire is to obtain information about the employees' perceptions of 15 different job factors and their contribution to the development of musculoskeletal disorders.

The Brazilian-Portuguese version was culturally adapted by Coluci and Alexandre in 2008. During the cross-cultural adaptation, workers in metallurgical industries answered the questionnaire in order to evaluate psychometric properties.

The reliability of the version was found by assessing test-retest procedure at 7-day intervals. The Intraclass Correlation Coefficient (ICC) values demonstrated a good agreement for 11 items (73%) of questionnaire, with ICC values ranging from 0.61 to 0.73.

The construct validity was tested using the known-groups technique, applying the questionnaire to distinct groups of employees (production and administrative workers). The results showed significant differences between the answers of these groups in 10 questions of the questionnaire. The validity was also established by comparing the perception of situations that could contribute to work-related pain/injury, and the presence of musculoskeletal symptoms. The validity test showed significant differences (p<0.01) on the scores of each item of the job factors questionnaire between two types of subjects, according to the Nordic questionnaire: those that did and did not indicate the presence of symptoms.

Having adapted the Job Factors Questionnaire to the Brazilian-Portuguese language, the aim of the present work was to develop a questionnaire used to evaluate its usability.

**THEORETICAL REFERENCE**

The literature has been focusing on alerting researchers about a correct evaluation of psychometric qualities of instruments. The most important attributes should be validation, reliability, usability, sensitivity, and responsiveness.

Therefore, it is relevant to carry out the evaluation about all psychometric properties of instruments used in health areas. Furthermore, usability refers to the practical aspects of questionnaires, such as, the easiness of administration on time constraints. This indicates that researchers should consider the usability during the selection of any data-gathering instrument. In this study, a performance-based approach, designed in terms of time and areas of difficulty during a test, was chosen to evaluate the usability of a job factors questionnaire.

**METHODOLOGY**

**Development of the Instrument Usability Evaluation of Instruments**

The usability instrument was developed based on the literature about evaluation and usability of questionnaires, and specialists' knowledge about this area. The aim of this instrument was to measure the necessary time for answering and analyzing the easiness indicated by the subjects in filling out the Brazilian version of the Job Factors Questionnaire.

During the development, a starting and ending times were included at the beginning of the usability questionnaire. Two questions were developed: one was related to the easiness of understanding the instructions and questions of the job factors instrument, and the other one was about the easiness in answering this same questionnaire. A four-point Likert scale for answering was used in each question.

**Content Validity**

The development of the instrument Usability Evaluation of Instruments required an evaluation of its content validity. In order to achieve this property, a quantitative and qualitative analyses were made by an expert committee composed of three judges with previous experiences on the use of scales and questionnaires. They received the developed questionnaire and an instrument specially prepared by the researchers to facilitate their analyses.

Firstly, each judge made an initial independent assessment during ten days. The calculation of the percent agreement score, an important measurement to determine in a quantitative way the content validity, was possible with her/his judgment reports. The committee considered a good agreement percent, concerning the questionnaire items, when it was about 90%.

Secondly, a discussion with each judge was performed in order to verify which characteristics should be considered in the prefinal version.

The members of the committee analyzed the suitability and clarity of the questions related to the objective of this usability questionnaire, which refers to evaluating the easiness in answering the items of the job factors questionnaire. After considering their suggestions, the prefinal version to be applied on the pretest stage was obtained.

**Test of the Prefinal Version**

The pretest was carried out with 40 subjects. Among them, 20 were production workers of a metallurgical industry, 15 administrative workers of
Developing a questionnaire about usability

the same industry, and five liberal workers. Considering that they presented different school levels, a better verification of the population knowledge about the items and responses was allowed.

Each subject filled out the job factors and the usability questionnaires. Afterwards, the subjects were individually interviewed with respect to the understanding of the words and items as well as about the filling procedure itself.

Using the Usability Evaluation of Instruments

The administration of this instrument was carried out with workers of the production and administrative sectors of two metallurgical industries. Only participants with age over 18 years old and that had been performing the same work tasks for at least three months were included.

Data were colleted during the subjects’ workday by using self-report instruments. Sociodemographic data were obtained through an Identification Questionnaire applied to the subjects.

The Brazilian version of the Job Factors Questionnaire, which included a descriptive list about 15 job factors, was firstly applied, and the subjects were asked to indicate, on a scale 0-10 (where zero meant no problem and ten major problem), how much each factor contributed to their work-related musculoskeletal symptoms.

Afterwards, the subjects filled out the Usability Evaluation of Instruments right after answering the job factors questionnaire. This instrument included three questions related to their understanding about the instructions, the questions, and how to answer the job factors questionnaire. The subject responses were expressed through a five-point Likert scale (from 1 = totally disagree to 5 = totally agree). The time measurement was achieved by using the starting and ending times collected at the beginning and at the end of the Job Factors Questionnaire, respectively.

Statistical Analyses

The collected data were inserted into the Microsoft Office Excel / 2003 software and submitted to statistical analysis with the collaboration of the University’s Statistical Services, using The SAS System for Windows version 9.1.3 and SPSS for Windows version 10.0 software systems. A descriptive analysis was carried out to describe the sample and to evaluate the results obtained from the expert committee, pretest, and with the Usability Evaluation of Instruments.

Ethical Considerations

The full protocol was approved by the University’s Research Ethics Committee by the reference number 112/2007. All subjects that participated in the present study were asked to provide informed consent.

RESULTS AND DISCUSSION

The aim of this study was to develop an usability questionnaire in order to verify this psychometric property of the Brazilian version of the Job Factors Questionnaire among production and administrative workers of metallurgical industries.

During the development process, the content validity of the Usability Evaluation of Instruments was performed by an expert committee, in order to determine the relevance of the items’ content of the instrument17,18. Analyses were carried out by the judges, following procedures suggested by the specialized literature16-18.

The results of the expert committee meeting are summarized in Table 1.

| TABLE 1: Percent agreement score calculated from the expert committee meeting, Campinas-SP, 2007. |
|----------------------------------|---|---|---|---|---|
| Judges | 1 | 2 | 3 | TA | TJ | PAS (%) |
| Title | A | A | A | 3 | 3 | 100.0 |
| Registered time | A | NA | A | 2 | 3 | 66.6 |
| Instructions | A | A | A | 3 | 3 | 100.0 |
| Q1 | A | NA | A | 2 | 3 | 66.6 |
| Q2 | A | A | NA | 2 | 3 | 66.6 |
| Scale | NA | NA | NA | - | 3 | - |

TA = total number of judges who agreed with the item; TJ = total number of expert committee’s judges; PAS (%) = Percent agreement score; NA = not agreement; A = agreement.
The title and instructions of the questionnaire showed a percent agreement score of 100%; therefore, no changes were necessary.

However, the registered time was changed after suggestion of one of the judges, and it was included into the instrument about job factors in order to facilitate the registration of the real time spent filling out it.

The question 1 was divided into two questions. One of them was related to the subjects’ understanding about the instructions, and the other one was about the questions themselves. The question 2 received simple changes, such as the substitution of the original words by their synonyms.

The response scale was altered by the expert committee, since all judges indicated the inclusion of the no opinion option.

Similarly to other studies about usability questionnaires\(^{19,20}\), this instrument was made with a five-point Likert scale and with statements about the easiness to understand the job factors questionnaire.

After changes performed during the content validity stage, the pretest was applied to verify if there was any difficulty on questions and/or on the five-point Likert scale.

Based on the interviewed subjects, no changes were necessary, since no subject showed difficulties in answering it. Appendix 1 shows the final version of the Usability Evaluation of Instruments (in English and Portuguese languages).

A total of 148 subjects participated in the study. Their sociodemographic characteristics are described in Table 2.

**TABLE 2: Sociodemographic characteristics. Campinas-SP, 2007. (N=148).**

<table>
<thead>
<tr>
<th>Level</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 20</td>
<td>10</td>
<td>6.8</td>
</tr>
<tr>
<td>20-29</td>
<td>54</td>
<td>36.5</td>
</tr>
<tr>
<td>30-39</td>
<td>31</td>
<td>20.9</td>
</tr>
<tr>
<td>40-49</td>
<td>38</td>
<td>25.7</td>
</tr>
<tr>
<td>50-59</td>
<td>14</td>
<td>9.5</td>
</tr>
<tr>
<td>≥ 60</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>134</td>
<td>90.5</td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>9.5</td>
</tr>
<tr>
<td>School levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incomplete secondary school</td>
<td>29</td>
<td>19.6</td>
</tr>
<tr>
<td>Complete secondary school</td>
<td>19</td>
<td>12.8</td>
</tr>
<tr>
<td>Incomplete high school</td>
<td>13</td>
<td>8.8</td>
</tr>
<tr>
<td>Complete high school</td>
<td>64</td>
<td>43.2</td>
</tr>
<tr>
<td>Incomplete undergraduate studies</td>
<td>14</td>
<td>9.5</td>
</tr>
<tr>
<td>Complete undergraduate studies</td>
<td>8</td>
<td>5.4</td>
</tr>
<tr>
<td>Graduate studies</td>
<td>1</td>
<td>0.7</td>
</tr>
</tbody>
</table>

The mean age of the investigated population was 34 years old – standard deviation (SD) 11.3. Most of it were male (90.5%), and the mean value of the body mass index was 24.2 kg/m\(^2\) (SD 3.5). Most subjects (43.2%) have completed high school; however, there was a significant percent (41.2%) of primary school subjects.

Using the usability questionnaire, the mean time spent to fill the Brazilian version of the Job Factors Questionnaire was approximately four minutes and thirty seconds, with a standard deviation of two minutes and twenty-one seconds.

Results from the three questions about usability of the job factors questionnaire are summarized in Table 3.

**TABLE 3: Results obtained using the Usability Evaluation of Instruments. Campinas-SP, 2007. (N=148).**

<table>
<thead>
<tr>
<th>Questions</th>
<th>TD</th>
<th>PD</th>
<th>NO</th>
<th>PA</th>
<th>TA</th>
</tr>
</thead>
<tbody>
<tr>
<td>I found it was easy to understand the questionnaire’s instructions</td>
<td>-</td>
<td>4</td>
<td>7</td>
<td>53</td>
<td>84</td>
</tr>
<tr>
<td>I found it was easy to understand the questions</td>
<td>-</td>
<td>6</td>
<td>7</td>
<td>52</td>
<td>88</td>
</tr>
<tr>
<td>I found it was easy to fill out the questionnaire’s response scale</td>
<td>-</td>
<td>5</td>
<td>5</td>
<td>40</td>
<td>98</td>
</tr>
</tbody>
</table>

TD=totally disagree, PD=partially disagree, NO=no opinion, PA= partially agree, TA= totally agree, N=number of subjects, %=percent

The results showed that 56.8% of subjects totally agreed with the statement I found it was easy to understand the questionnaire’s instructions, 56.1% totally agreed with I found it was easy to understand the questionnaire’s questions, and 66.2% totally agreed with I found it was easy to fill the questionnaire’s response scale.

It is important to notice that the school level assessment demonstrates that the developed instrument has a high acceptability among subjects from all levels.

This can indicate that the Brazilian version of the job factors questionnaire is simple, very understandable, easy to answer, and fast to be filled out by production and administrative workers of metallurgical industries, which demonstrates a good acceptability of this instrument.

The Usability Evaluation of Instruments was developed in order to obtain the time necessary to answer another instrument and to evaluate the easiness in its administration. It is very important to analyze the acceptability of a questionnaire by the workers and by those who represent them, because the time spent filling it out involves costs, feasibility, and quality of collected data\(^7\).

**CONCLUSION**

The development process of the usability questionnaire was completed with success. The
content validity was analyzed by an Expert Committee, following acceptable methodologies.

In conclusion, this study described how to assess one of the psychometric properties of instruments used in health research. The Usability Evaluation of Instruments may be helpful to investigators worried about the quality of instruments used to data collection.

REFERENCES


Appendix 1 (English)

Usability Evaluation Questionnaire

Considering the questionnaire called Job Factors Questionnaire that you have just led, please circle the number that best represents your answer to these firmatives:

I found it was easy to understand the questionnaire’s instructions.


I found it was easy to understand the questionnaire’s questions.


I found it was easy to fill the questionnaire’s response scale.


Appendix 1 (Portuguese)

Avaliação da Praticabilidade de Instrumentos

Considerando o questionário chamado Instrumento sobre fatores de trabalho que você acabou de preencher, por favor circle o número que representa melhor a sua resposta quanto às seguintes afirmações:

1. Eu achei fácil entender as instruções do questionário.


2. Eu achei fácil entender as questões do questionário.


3. Eu achei fácil assinalar as respostas do questionário.