

Assessment of psychosocial stressors at work: psychometric properties of the JCQ in Colombian workers

Evaluación de estresores psicosociales en el trabajo: propiedades psicométricas del Cuestionario del contenido del trabajo (JCQ) con trabajadores colombianos

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Abstract

Because the two main models and instruments used to evaluate psychosocial factors at work were developed and applied primarily in developed countries, there are still questions about their properties in less economically developed countries. In this study, a Spanish version of the Job Content Questionnaire (JCQ) was tested in Colombia. Cross-sectional studies, with self-administered surveys, were performed among 294 nurses, 281 bus drivers, and one mixed occupational group with 661 participants. Means and standard deviations among Colombian workers were compared against each other and with averages from studies in other countries. The internal consistency was analyzed through the Cronbach alpha coefficient; the factorial validity through exploratory factorial analysis; concurrent validity of the instrument was calculated using correlations with the effort/reward ratio of the ERI Questionnaire; the predictive validity was tested using correlations with one indicator of health. Differences between samples were generally small, but some interesting tendencies could be observed. The Cronbach's alpha coefficients were generally

Resumen

Debido a que los dos principales modelos e instrumentos usados para evaluar factores psicosociales en el trabajo se han propuesto y estudiado principalmente en países desarrollados, persisten dudas sobre sus propiedades psicométricas en países menos desarrollados económicamente. En este estudio, se evaluó en Colombia una versión en español de cuestionario del contenido del trabajo. Se realizaron estudios transversales con 294 enfermeras, 281 conductores y 661 personas con ocupaciones mixtas. Las medias y desviaciones estándar de los trabajadores colombianos se compararon con las reportadas en estudios de otros países. La consistencia interna se analizó mediante el alfa de Cronbach; la validez factorial con análisis factorial exploratorio; la validez concurrente se calculó usando correlaciones con el indicador de desbalance Esfuerzo/Recompensa del cuestionario ERI; la validez predictiva se evaluó a través de correlaciones con un indicador de salud. En general las diferencias entre las muestras fueron pequeñas, pero a pesar de ello mostraron tendencias interesantes. Los coeficientes alfa de Cronbach fueron

acceptable. Difficulties with three items (JCQ 2, 6 and 14) were found. The factor analyses indicate that the best factorial solution has seven factors. The most problematic factor seems to be “decision latitude”. Some items have inconsistent loadings and reliability problems. Most of the JCQ scales were correlated with the health indicators in the expected direction. Finally, the “job strain” indicator and the effort/reward ratio were positively correlated. It was concluded that the Spanish version of the JCQ is an acceptable instrument to assess psychosocial risk factors among workers in Colombia.

Keywords: Demand-control model, JCQ, psychometric properties, psychosocial factors and occupational stress.

A persistent perception of an imbalance between demands and available resources to cope with them is defined as stress, a phenomenon which usually facilitates the development of health difficulties. In the occupational context, two main models are currently used to evaluate the psychosocial factors at work, which seem to be some of the most important causes of job-stress: the Demand-Control-Support (DCS) model (Johnson & Hall, 1988; Karasek Theorell, 1990) and the Effort-Reward Imbalance (ERI) model (Siegrist, 2002). A lot of researches have been developed based on these theoretical approaches and the instruments supported by them. However, because the models and instruments were developed and applied primarily in developed countries, there are still questions about their usefulness in developing countries. There are Spanish versions of the questionnaires designed to evaluate the psychosocial factors proposed by the models, but the process of evaluation of their psychometric properties is still incomplete. More applications to different occupational groups of various Spanish speaking countries are needed to confirm its characteristics and to improve deficiencies detected. The purpose of this paper is to report data about the reliability and validity of a Spanish version of the JCQ applied to Colombian workers.

The problem of work related stress is significant “in countries in transition who are subjected to rapid and drastic economical and social changes (for example in Russia), where there is an increased demand for adaptation of workers, the over-riding of traditional values, the reorientation of

acceptables. Los análisis factoriales indicaron una solución de 7 factores, siendo el relacionado con “latitud de decisión” el más problemático. Algunos pocos ítems mostraron cargas factoriales inconsistentes y dificultades de confiabilidad. La mayor parte de las correlaciones con el indicador de salud fueron las esperadas. Finalmente, el indicador de tensión laboral y el de desbalance esfuerzo/recompensa estuvieron positivamente relacionados, lo que indica una buena validez concurrente. Se concluye que esta versión en español de JCQ es un instrumento adecuado para evaluar los riesgos psicosociales laborales en Colombia.

Keywords: Modelo Demanda-Control, JCQ, propiedades psicométricas, factores Psicosociales, estrés ocupacional

the occupational health system, and generally poor working conditions. Traditionally, the focus of Occupational Health and Safety initiatives is on chemical, biological and physical exposures, while the psychosocial risks at work are still largely neglected and their causes and consequences still insufficiently understood as they pertain to the developing country context. The current division between working conditions and the (physical) work environment makes the inclusion of the psychosocial risks at work harder to identify by most of the Occupational Health and Safety professionals” (Houtman, Jettinghoff & Cedillo, 2007, p. 1). Although it can be now documented an array of research on the magnitude of causes and consequences of work-related stress in developed and industrialized countries, work related stress is still a problem which is far from being resolved. In turn, very little data is available from developing countries. To have the possibility of assessing the magnitude of job strain due to psychosocial stressor in countries like Colombia, and most important to retain the possibility of comparing the results of these evaluations with those of the countries in which it has been measured for longer periods of time, it is necessary to examine the psychometric properties of the existing questionnaires, in this case of the JCQ. In line with the main theoretical conceptualizations of the Demand-Control-model (Karasek, 1979) and the Demand-Control-Support model (Johnson & Hall, 1988; Karasek & Theorell, 1990), the Job Content Questionnaire (JCQ) is an instrument designed to measure some social and psychological aspects of work tasks that generate job strain.

The Demand-Control-Support model deals primarily with the content of work (Theorell, 1998). The most important components of the Demand-Control-Support model are psychological job demands and decision latitude. The Demand-Control model posits that the primary work related psychosocial risk factor is the lack of control over how one meets one's demands and how one uses one's skills. The jobs most likely to cause distress are hypothesized to be those in which working people are faced with high demands and low control (i.e. high strain).

Social support from the supervisor or the coworkers and job insecurity are other JCQ scales, which under the current employment conditions are of increasing importance. The Demand-Control model was expanded to include a dimension related to social relations termed Social Support (SS). Social Support in the workplace refers to overall level of helpful social interactions available on the job from supervisors and co-workers (Karasek & Theorell, 1990). Social support might affect the workers' well-being by acting as a buffer between psychosocial stressors at the workplace and adverse health outcomes (Karasek, Gardell & Lindell, 1987). "The worst combination—high demands, low decision latitude and low support—would have the most adverse consequences" (Johnson, Hall & Theorell, 1989, p. 207).

The impact of the stressful working conditions proposed by the job strain model on health have been investigated during many years. Several studies have shown the effect of job strain (jobs with high demands and low control) on high blood pressure, coronary heart diseases and psychological distress, musculoskeletal disorders, diabetes, psychiatric illness, gastrointestinal illness, occupational and traffic accidents, cardiovascular mortality, alcohol related diseases, absenteeism, sleeping problems, depression, anxiety, work satisfaction and psychological well-being, among others (Johnson & Hall, 1988; Johnson, Stewart, Hall, Fredlund, & Theorell, 1996; Karasek, Baker, Marxer, Ahlbom, & Theorell, 1981; Karasek, 1988; Landsbergis, 1993; McClenahan, Giles, & Mallett, 2007; Rydstedt, Devereux, & Sverke, 2007; Salavecz, Chandola, Pikhart, Dragano, Siegrist, & Jöckel, 2010; Schnall, Belkic, Landsbergis, & Baker, 2000; Theorell & Karasek, 1996; Van der Doef & Maes, 1999).

Most research based on this theoretical approach using the JCQ instrument was developed in English and

primarily applied for jobs among men in countries with high economic development. Differences in cultural and socio-economic level of development among countries, since they often play a role in determining an individual's values and perceptions, can be expected to create difficulties in applying the JCQ in countries different from the ones in which it has been initially validated. What is stressful for one person in a given country may not be as stressful for another in a different one (Lazarus, 1999), and in turn affects their response to the instrument developed for use elsewhere. A similar argument can be made with respect to the gender of the workers, considering that analyses based mainly on male data could not be easily applied to female workers.

Various authors have analyzed psychometric characteristics of the JCQ scales in languages different from the original (English) and in countries with unequal economic development: Kawakami and Fujugaki (1996), and Kawakami, Kobayahi, Araki, Haratani and Furui (1995) reported that JCQ scales were reliable for Japanese population, while Brisson, Blanchette, Guimont, Dion, Moisan and Vezina (1998), Sale and Kerr (2002), and Pelfrene, Vlerick, Mak, Smets, Kornitzer and Backer (2001) reported similar results in Canadian and Belgian population, respectively. A Finish version was analyzed by Santavirta (2003) with nurses and teachers, a Dutch one by Storms, Casaer, De Wit, Van Den Bergh and Moens (2001), a Swedish one by Sanne, Torp, Mykletun, and Dah l(2005), a Maly one by Edimansyah, Rusli, Naing, Mazalisah and Kamarudin (2005), a Korean one by Eum, Li, Jhun, Park, Tak, Karasek and Cho (2007), a Chinese one by Li, Yang, Liu, Xu and Cho, (2004), a French one by Niedhammer, Chastang, Gendrey, David and Degioanni, (2006), and Escribá, Más and Flores (1999) perform a similar work with a group of Spanish nurses. The results of these studies show in general good reliability of the scales (Cronbach alpha's between 0.6 and 0.8), a factorial structure similar to the original questionnaire, and good predictive validity with different health indicators (cardiovascular, job satisfaction, anxiety, depression, negative affectivity).

A compilation from studies in four different countries (Canada, USA, the Netherlands and Japan), some of them at a national level, was conducted by Karasek, Brisson, Kawakami, Houtman, Bongers and Amick (1998), showing the usefulness of the JCQ application across countries as well as the similarity in its psychometric values.

Results suggest that psychological job characteristics (job demands, decision latitude) are more similar across national boundaries than across occupations. Karasek, et al. (op. cit., 1998) found, across the developed countries compared, surprisingly small differences in psychosocial job scales means, standard deviations, scale correlations or factor patterns. They affirm that their findings suggest “small workplace cross-national differences and much larger and consistent interoccupational differences” (p. 345).

Additionally, as previously mentioned, there is extensive research literature showing the predictive validity for health outcomes, using the JCQ scales. Karasek, et al. report that “the JCQ and JCQ-like scales have demonstrated substantial predictive validity with respect to stress-related chronic disease in international and U.S. research” (1998, p. 330). Confirmation of the equivalency of psychometric properties of the JCQ between industrialized countries and developing economies has not been enough demonstrated. The conceptual and methodological strengths of the Demand-Control model are two important reasons to consider the adaptation of the JCQ to assess the psychosocial risk factors in workers of developing countries.

To the best of our knowledge, in Latin America only Cedillo & Karasek (2003) have published a psychometric evaluation of the Spanish JCQ with Mexican population and Araujo & Karasek (2008) presented a psychometric analysis of a Brazilian version. The report of Cedillo & Karasek (2003) describes extensively the results of an exploratory factor analysis with varimax rotation for the Decision Latitude (Skill discretion –SD–, and decision authority –DA) and Psychological Demands (PD) items. “Repetitive work” showed non-significant alignment with the two factors and had very low communality. “Freedom as to how” fell under Factor 2, corresponding to the Psychological Demands scale instead of falling under Factor 1, as expected, and had very low communality as well. “Have enough time”, which also showed very low communality, was negatively loaded in Factor 1 and had very low positive loading in Factor 2. “Wait for other to complete tasks” had low loading and communality values (p. 19).

Cedillo & Karasek (2003) reported that the Cronbach alpha reliability values for the three main scales (SD, DA and PD) of the JCQ for their sample are lower than the international mean (these coefficients can be seen in Table 1). When one item was deleted (“repetitive work” for SD

and “freedom to decide how” for PD), the reliability value of Skill Discretion and Psychological Demands scales improved to acceptable values (Cronbach’s alpha more than .60), which was comparable to the international Cronbach alpha means. The values show low variability across the compared occupational groups. In the case of the Decision Authority scale there was no substantial improvement when one item was removed and there is a big gap between the values across the subgroups.

Cedillo & Karasek (2003) said that the means of the JCQ scales from the Mexican study were very similar to the international means. They only differ slightly in the Skill Discretion and Psychological Demands scales. As expected, scales that showed the best differentiating power among occupational groups were Skill Discretion and Decision Authority, followed by physical demands and coworker support. Finally, the correlations among the JCQ scales from the Mexican study and the international means of correlations are very similar. From 15 correlations “only two differ substantially from the international values, and one of those corresponds to the Psychological Demands dimension. This dimension is also the one that showed the most variety among the other countries values” (see Karasek, et al., 1998). 80% of the correlations were similar or moderately similar to the reported international values, and only 20% were quite different” (Cedillo & Karasek, 2003, p. 21).

Araujo & Karasek (2008) reported that means of the several JCQ scales used did not differ substantially from those obtained in European studies, albeit were slightly lower in the Brazilian case. In general, the Cronbach alpha coefficients revealed performance similar to other large sample studies, conducted in developed countries. The coefficients were relatively similar for formal and informal jobs. The authors affirm that the factor analysis revealed a high consistency with the theoretical model.

The present paper sets out to test the psychometric properties of the Spanish version of the JCQ questionnaire in different samples in Colombia and to compare these results to similar groups in other LA countries. The results reported here were obtained from three different Colombian samples (nurses, drivers and a mixed occupational group). The internal consistency (Cronbach alpha) and the exploratory factorial validity were calculated and compared between the samples and with the results from studies in

other countries (Cedillo & Karasek, 2003; Karasek, Brisson, Kawakami, Houtman, Bongers & Amick, 1998). Concurrent and predictive validity of the instrument were also studied and compared between the Colombian samples. For the concurrent validity, the Job Strain value of each person was correlated to its imbalance between effort and reward value obtained with the ERI Questionnaire¹. Finally, the predictive validity was calculated correlating the value of each JCQ-scale and the Job Strain score with the subscales and total score of the General Health Questionnaire (GHQ-28).

Method

Participants

The total sample was constituted by 1236 workers. The three samples studied were 294 nurses (women, mean age 36, *SD* 9.79; five-year average work experience), 281 bus drivers (men, mean age 40, *SD* 8.3; five-year average work experience) and a group of 661 participants with mixed occupations (302 men and 357 women; mean age 31, *SD* 9.8; 5.4-year average work experience). This last sample included participants of the full occupation spectrum (belonged to the private and public sectors of Colombia, were managers, professionals, educator, clericals, service, white-collar and blue-collar workers and supervisors) working in Bogotá, Colombia. All participants gave their informed consent prior to their inclusion in the study and were told that they could stop their participation at any moment they wanted. Their identities were protected during the research process coding their questionnaires with numbers.

Instruments

An official Spanish version of the JCQ (27 items) was obtained from de JCQ-center (translation from Leonor

Cedillo). This version was previously used with Mexican population (Cedillo & Karasek, 2003; Juárez, 2007). It includes the following scales and number of items: decision latitude is composed of two subscales, e.g. job skill discretion (six items) and job decision-making authority (three items); job demands (five items); supervisor support (four items); co-worker support (four items); job insecurity (four items); physical job demands (one item). Answer choices for every question were presented on a four-point Likert-type scale. The extremes were labeled “strongly disagree” (totalmente en desacuerdo) and “strongly agree” (totalmente de acuerdo), respectively. Cronbach coefficients obtained are in Table 1.

Health was assessed in these samples using the General Health Questionnaire (GHQ-28). This scale is composed of four subscales: somatic symptoms, anxiety, depression, and social dysfunction. Each scale has seven items which are rated in a four-point Likert-type scale that ranged from 1= no, absolutely (no, en lo absoluto) to 4= more than usual (más de lo habitual). The Cronbach alpha for the four scales in all the samples oscillate between 0.7 and 0.88.

An official Spanish version of the ERI was obtained from the Spanish researcher who did the translation and evaluation of it in Spain (Juan Antonio Fernandez). It includes the following scales and number of items: extrinsic effort (6 items, range 1-5, totals core: 6-30); reward (11 items, range 1-5, total score: 11-55): Items are answered in two steps. First, subjects agree or disagree whether or not the item content describes a typical experience of their work situation. Subsequently, subjects who agree are asked to evaluate to what extent they usually feel distressed by this typical experience. The rating procedure is defined as follows: (1) does not apply; (2) does apply, but subject does not consider herself or himself distressed; (3) does apply and subject considers herself or himself somewhat distressed; (4) does apply and subject considers herself or himself distressed; (5) does apply and subject considers herself or himself very distressed. Regarding the overcommitment dimension (6 items, range 1-4, total score: 6-24), participants are asked to choose among four Likert-type options ranging from “strongly disagree” to “strongly agree”. Imbalance between effort and rewards is a ratio computed for every respondent according to the following predefined algorithm: $e/r*c$, where ‘e’ is the sum score of the effort scale, ‘r’ is the sum score of the

¹ The ERI model claims that stressful experiences at work and their consequent negative effect on the health results from the perception of imbalance between high efforts and low rewards; in other words, a lack of reciprocity between cost and gains. Gains or rewards, according to the ERI model, are distributed to the working people by three transmitter systems: money, esteem and status control in terms of promotion prospects and job security. The combination of this imbalance with a high level of overcommitment increases the propensity to autonomic arousal and associated strain reactions. The ERI model has been operationalized as a standardized self-report measure containing 23 Likert-scaled items in its established short version. These items define three unidimensional scales: “effort”, “reward”, and “overcommitment”.

reward scale and 'c' defines a correction factor for different numbers of items in the nominator and denominator. The correction factor is 0.454545 if the nominator contains five items (5/11) and 0.5454 if it contains six items (6/11). As result, a value close to zero, indicates a favorable condition (relatively low effort, relatively high reward) whereas values beyond 1.0 and close to 2.0 indicate a high amount of effort spent that is not met by the rewards received or expected in turn. In general, published studies showed appropriate internal consistencies of the three scales: effort, reward, and overcommitment. Cronbach alphas were between 0.71 and 0.78 for effort; between 0.78 and 0.86 for reward, and between 0.74 and 0.76 for overcommitment. exploratory and confirmatory factor analysis replicated the theoretically assumed structure of the ERI construct in men and women (Gómez, 2010).

Socio-demographic information covered age, sex, years in education, job title, working career, and weekly paid working hours.

Procedure

Data were gathered in cross-sectional studies utilizing a self-administered survey after informed consent was obtained from each subject. The participants selection was non probabilistic. All members of the target populations were invited through personal letters or internal communications of their organizations. Participations rates varied between 80% and 90%. Questionnaires were coded with numbers to protect the identities of the participants. The internal consistency and the factorial, concurrent and predictive validity for the instrument were analyzed through the

Cronbach alpha coefficient, exploratory and confirmatory factor analysis, and correlations with the effort/reward ratio of the ERI and with the health questionnaire. For the factorial analysis the principal extraction method was used. The factors were orthogonally rotated using varimax. Factor loadings equal to or larger than .30 were accepted as sufficient loadings. An indicator of job strain was calculated using the suggestion of the JCQ-Center: "A job strain ratio term: (Demands *2)/Decision-Latitude. A score >1 would indicate job strain". This ratio is a continuous value that could be correlated with those of the General Health Questionnaire and of the ERI.

Results

Mean scales

As the Table 1 shows, the means of most subscales of the JCQ are similar across studies. Differences between samples were small but all significant ($F= 84.9, 17.6, 57.0, 43.2, 34.4, 11.3, 30.5, 11.8; p < 0.01$); some tendencies could be observed: skill discretion and decision authority (decision latitude) are higher in the nurses and the Colombian mixed occupational group. Decision latitude (both scales) is the lowest in the Colombian bus drivers. The psychological demands are also higher in the group of Colombian nurses and lower in the Mexican women (women samples). The means of the coworker support are very similar between groups, but the support of the supervisor is the lowest in the group of Colombian bus drivers. Finally, the mean of job insecurity is much higher in the Colombian samples than in the other; the highest mean is the one of the Colombian nurses.

Table 1.
Means of the JCQ-scales of the different groups compared

JCQ Scales	Job Skill Discretion	Decisión-making authority	Decision latitude	Psychological demands	Job Strain
Groups					
Nurses*	37.3 (4.9)	33.3 (6.4)	70.6 (9.8)	34.0 (3.7)	1.0 (0.2)
Drivers*	26.0 (6.2)	29.9 (7.2)	55.9 (9.7)	32.6 (6.4)	1.2 (0.3)
Mixed Occupations#	36.7 (5.2)	32.9 (5.5)	69.5 (8.9)	33.7 (4.3)	1.2 (0.3)
Total	30.8 (5.4)	32.5 (5.5)	63.3 (9.6)	33.1 (6.3)	
Internacional ^l	35.0 (7.2)	34.8 (8.2)	69.8 (13.6)	31.9 (6.9)	
México	34.5 (4.8)	32.4 (7.3)		29.3 (6.4)	

*Arango. 2007; #Marulanda. 2007; ^lKarasek et al. 1998; %Cedillo & Karasek. 2003

Table 1 continued

JCQ Scales	Supervisor Social Support	Coworker social support	Social Support	Job Insecurity
Groups				
Nurses [*]	10.9 (2.4)	12.0 (2.0)	22.9 (3.5)	7.0 (2.3)
Drivers [*]	9.7 (2.8)	11.3 (2.1)	20.9 (4.2)	6.3 (2.4)
Mixed occupations [†]	11.7 (2.5)	12.3 (2.2)	23.9 (4.0)	6.0 (2.0)
Total	11.1 (2.6)	12.0 (2.2)	23.2 (4.1)	6.3 (2.2)
Internacional [‡]	12.1 (2.9)	12.4 (2.3)		4.1 (1.6)
México	11.2 (2.4)	12.2 (2.1)		3.3 (0.9)

^{*}Arango. 2007; [†]Marulanda. 2007; [‡]Karasek et al. 1998; %Cedillo & Karasek. 2003

Internal consistency

As can be seen in the Table 2, internal consistency of the subscale “job skill discretion” with Colombian workers was higher than the Mexican women, and similar in comparison to the averages obtained in the United States and in Europe. The Cronbach alpha coefficients were generally acceptable.

When one item (item 2, “repetitive work”) was deleted, the reliability of the scale (calculated for all the groups) improved and was similar to the international values (see Table 3). The study with the Mexican sample identified psychometric problems with this item also. Juárez-García (personal communication, October 2008) suggests to delete the item or to substitute the word “repetitivo” for the word “aburrido (bored)”. The modified item had a better reliability in some Mexican pilot studies with it.

The subscale “decision-making authority” had a low reliability for all samples. The values obtained for Colombian samples were similar to those obtained in México and lower compared to those calculated with international (Canada, Netherlands, USA, Japan) samples. The internal consistency (calculated for the entire group) improved when one item (item 6, “freedom to decide how”) was deleted (see Table 3). In the English version, this item has a positive direction (“lot of freedom”); the Spanish version has a negative

direction (“not a lot of freedom”). This item presented psychometric difficulties in the Mexican sample too.

Internal consistency of the scale “decision latitude”, which is the combination of “job skill discretion” and “decision-making authority”, was acceptable and improves when the items 2 and 6 were deleted.

The scale “job demands” had an acceptable reliability that is similar to those obtained in other countries. The internal consistency of the scale improves when item 14 (“enough time to get the job done”) was deleted. In the Spanish version, this is the only item with a different direction in the Job demands scale. To delete this item improves the reliability of this scale in the Mexican study too.

In all the Colombian samples, the highest and most acceptable values of the coefficients were found for the “co-worker support” and “supervisor support” scales. They were similar to those obtained in other countries.

The “job insecurity” scale had a low reliability for most samples.

Corrected item-total correlation between each item and averages of the scales they belong to confirm the problems of the above mentioned items. Their correlations are the lowest even if they still are significant.

Table 2.
Cronbach's alpha coefficients of the JCQ-Scales of the different groups

JCQ-Scales	Job Skill Discretion	Decisión-making authority	Decision latitude	Psychological demands
Groups				
Nurses [*]	0.75	0.30	0.75	0.55
Drivers [*]	0.75	0.42	0.73	0.51
Mixed Occupations [#]	0.64	0.63	0.67	0.64
Internacional ^l	0.74	0.68	0.81	0.63
Internacional ^k	0.72	0.65		0.60
México [%]	0.64	0.48		0.66

*Arango. 2007; #Marulanda. 2007; ^lKarasek et al. 1998; ^k Karasek et al. 2003; [%] Cedillo & Karasek. 2003

Table 2 continued

JCQ-Scales	Supervisor social support	Coworker social support	Job Insecurity
Groups			
Nurses [*]	0.72	0.69	0.53
Drivers [*]	0.85	0.68	0.34
Mixed Occupations [#]	0.82	0.78	0.40
Internacional ^l			
Internacional ^k	0.84	0.76	0.60
México [%]	0.85	0.79	0.47
	11.2	12.2	

*Arango. 2007; #Marulanda. 2007; ^lKarasek et al. 1998; ^k Karasek et al. 2003; [%] Cedillo & Karasek. 2003

Table 3.
Statistical Analysis of the individual items

Item	Average	Standard deviation	Simetry	Cronbach's alpha for all groups combined	Correlation item-total scale
Jcq1	3.56	0.751	-1.81		.564**
Jcq2	3.07	0.763	-0.49		-.297**
Jcq3	3.42	0.783	-1.22		.667**
Jcq5	3.48	0.690	-1.17		.554**
Jcq7	2.94	0.826	-0.43		.583**
Jcq9	3.10	0.765	-0.54		.630**
SKILL DISCRETION	30.8	5.500	-0.84	0.70*	
Jcq4	2.85	0.850	-0.26		.645**
Jcq6	2.42	0.847	0.09		.264**
Jcq8	2.85	0.805	-0.35		.593**
DECISION AUTHORITY	32.5	5.969	0.09	0.49 ⁺	
Jcq10	3.20	0.771	-0.60		.618**
Jcq11	3.12	0.816	-0.58		.681**
Jcq13	2.39	1.012	0.16		.506**
Jcq17	2.37	0.880	0.21		.335**
Jcq14	2.44	0.844	0.09		.368**
PSYCHOLOGICAL DEMANDS	33.13	6.264	-0.12	0.64 [#]	
Jcq25	2.43	0.916	-0.03		.480**
Jcq26	2.92	0.778	-0.57		.699**
Jcq27	2.94	0.772	-0.52		.685**
Jcq28	2.87	0.823	-0.48		.687**
SUPERVISOR SOCIAL SUPP.	11.15	2.639	-0.33	0.81	
Jcq30	3.14	0.721	-0.61		.473**
Jcq31	2.72	0.823	-0.35		.538**
Jcq32	3.14	0.696	-0.63		.625**
Jcq33	3.03	0.669	-0.56		.548**
COWORKERS SOCIAL SUPP.	12.02	2.200	-0.23	0.75	
Jcq38	1.78	1.250	1.50		.249**
Jcq39	1.36	0.770	2.21		.061**
Jcq40	2.44	0.920	-0.12		.198**
JOB INSECURITY	6.27	2.200	0.51	0.55	

*Increases to 0.76 when item 2 was deleted; ⁺ Increases to 0.59 when item 6 was deleted; [#] increases to 0.68 when item 14 was deleted

Factorial validity of the JCQ scales

The exploratory factor analyses explains 63.7 % of the variance in bus drivers (five factors), 63.5 % in nurses (seven factors) y 59 % the mixed occupational group 1 (six factors). The factor analyses with the aggregated data of the three groups explained 58.6% of the variance (seven factors). Items 13 and 14 of the Psychological Demands-Scale have inconsistent loadings. Item 14 also

presents reliability difficulties. It is the only item of this scale worded in a positive way. Items 2 and 6, which have reliability problems, have also inconsistent loadings. The social support factors are clearly distinguished. Item 27 of the Job Insecurity-Scale didn't load correctly and needs some revision. In short, the data basically confirm the JCQ scales in the factor pattern, but with exceptions for some items, which ambiguously loaded with other factors.

Table 4.
Exploratory Factorial Analysis with varimax rotation with the whole sample.

JCQ-Items	Components						
	1	2	3	4	5	6	7
Jcq9 (JSD)	0.70						
Jcq7(JSD)	0.70						
Jcq8(DMA)	0.63						
Jcq4 (DMA)	0.63						
Jcq3(JSD)	0.62						
Jcq5(JSD)	0.47						
Jcq1(JSD)	0.43					0.47	
Jcq18 (SSS)		0.80					
Jcq20(SSS)		0.74					
Jcq19 (SSS)		0.72					
Jcq17 (SSS)		0.71					
Jcq23 (CSS)			0.81				
Jcq22 (CSS)			0.71				
Jcq24 (CSS)			0.71				
Jcq21 (CSS)			0.66				
Jcq12 (PhD)				0.72			
Jcq11(PD)				0.62			0.41
Jcq10(PD)				0.57			0.30
Jcq6(AMD)				0.52			
Jcq2(JSD)				0.46			
Jcq15 (PD)				0.46			
Jcq14(PD)							- 0.71
Jcq13(PD)				0.31			0.70
Jcq26(JI)					- 0.76		
Jcq16 (JI)					0.74		
Jcq25 (JI)					- 0.59		
Jcq27 (JI)						0.80	
Eigenvalues	5.48	2.72	2.09	1.59	1.42	1.33	1.16
% Expl. variance	20.29	10.09	7.74	5.88	5.24	4.94	4.30

JSD: Job Skill Discretion; DMA: Decision Making Authority; SSS: Supervisor Social Support; CSS: Coworkers Social Support; PhD: Physical Demands; PD: Psychological Demands; JI: Job Insecurity
 Component 1: decision latitude
 Component 2: supervisor social support
 Component 3: coworker social support
 Component 4: Psychological and Physical Demands
 Component 5: Job Insecurity

Predictive validity

The correlations with the health indicators in two of the Colombian samples (with the exception of the nurses) show that most of the JCQ scales are correlated with the health indicators in the expected direction (see Table 5). The scales “decision authority” and “psychological demands” do not correlate with all the health indicators in the mixed occupational sample. Decision authority correlates negatively only with social dysfunction and with total health (higher means indicate more health complains); psychological demands correlates positively only with depression. In the sample of the nurses only

“psychological demands” with “somatic symptoms” and “job insecurity” with “anxiety” correlate significantly.

Concurrent validity between ERI and JCQ

The “job strain” indicator and the “Effort-Reward Ratio” were positively correlated: Nurses ($r = 0.2$; $p=0.01$); Drivers ($r = 0.57$; $p<0.01$); Mixed occupational group ($r = 0.2$; $p<0.01$).The Effort-Scale of the ERI and the Psychological Demands-Scale of the JCQ are conceptually close. Their correlations were also significant and high. These correlations indicate that both constructs are not identical, but they are measuring closely related phenomena.

Table 5.
Correlations between scales of the GHQ-28 and scales of the JCQ

Scales of the GHQ-28	Scales of the JCQ	Skill Discretion	Decision Authority	Psychological Demands	Decision Latitude	Job Strain	Social Support	Co-worker Social Support	Supervisor Social Support	Job insecurity
Nurses (N = 294)										
Social Disfunction		0.03	0.03	0.04	0.04	0.03	0.05	0.07	0.01	0.03
Depression		-0.05	0.02	0.04	-0.01	0.03	-0.03	-0.04	-0.02	-0.01
Anxiety		0.02	0.02	0.08	0.01	0.07	-0.05	0.03	-0.11	0.19(**)
Somatic symptoms		0.08	0.06	0.13(*)	0.07	0.07	-0.02	0.07	-0.11	0.11
Total Health		0.04	0.05	0.10	0.04	0.07	-0.02	0.05	-0.09	0.13(*)
Drivers (N = 281)										
Social Disfunction		-0.42(**)	-0.15(*)	0.48(**)	-0.20 (**)	0.47(**)	-0.14(*)	-0.06	-0.16(**)	0.38(**)
Depression		-0.03	-0.08	0.16 (*)	-0.04	0.10	0.00	-0.09	0.10	-0.01
Anxiety		-0.14(*)	-0.33(**)	0.35 (**)	-0.17 (**)	0.35(**)	-0.20(**)	-0.14(*)	-0.2(**)	0.06
Somatic symptoms		0.01	-0.24(**)	0.30(**)	-0.01	0.24(**)	-0.08	-0.12(*)	-0.03	-0.06
Total Health		-0.08	-0.30(**)	0.35 (**)	-0.09	0.29(**)	-0.13 (*)	-0.13(*)	-0.09	-0.01
Mixed Occupations (N= 661)										
Social Disfunction		-0.19(**)	-0.14(**)	-0.02	-0.19(**)	0.16(**)		-0.12(**)	-0.18(**)	0.12(**)
Depression		-0.16(**)	-0.07	-0.08(*)	-0.14(**)	0.07		-0.13(**)	-0.12(**)	0.05
Anxiety		-0.09(*)	-0.05	0.03	-0.09(*)	0.09(*)		-0.15(**)	-0.18(**)	0.12(**)
Somatic symptoms		-0.15(**)	-0.07	0.06	-0.13(**)	0.16(**)		-0.13(**)	-0.18(**)	0.09(*)
Total Health		-0.19(**)	-0.09(*)	0.00	-0.16(**)	0.14(**)		-0.18(**)	-0.21(**)	0.11(**)

(* $p < .05$; ** $p < .01$)

Table 6.
Correlations between Job Strain and Effort-Reward Imbalance and between the Effort-Scale (ERI) and the Psychological Demands-Scale (JCQ)

Occupational Groups	ERI-JCQ	Effort- Psychological Demands
Nurses	0.2*	0.5*
Drivers	0.6*	0.5*
Mixed occupational group	0.2*	0.5*
Total	0.3*	0.5*

* $p < 0.1$

Discussion

Based on the results on three groups of Colombian workers presented in this article, it can be said that the Spanish version of the job content questionnaire has shown to be an adequate measurement instrument of the psychosocial risk factors at work. The measurement properties of the Spanish JCQ questionnaire with Colombian samples are acceptable and comparable to those described for the original English version and for other languages and countries. The Spanish version of the JCQ tested in this study proved to be reliable at acceptable levels.

Difficulties with three items (JCQ 2, 6 and 14) were found. However, some improvements that could be undertaken are suggested, like the development of a better wording to explain the concept of “repetitive work” and formulate the item 6 (enough time) in the same positive direction that it has in the original English questionnaire. In the English version this item had no problems. These three items have showed difficulties in previous studies. For example, Pelfrene, et al. (2001) argue that “the item ‘repetitive work’ had a low loading on the decision latitude factor. This has also been observed in other studies (De Jonge, Reuvers, Houtman, Bongers & Kompier, 2000; Kawakami et al., 1995). Actually, for Karasek, et al., (1998), the most troublesome decision latitude item in most studies is indeed ‘repetitive work’ (...). According to the authors of that review paper, it can be explained by its skewed distribution, as repetitive work is much more common at the lowest skill level” (p. 311).

The item 14, “conflicting demands”, have low and inconsistent loadings on the factor related to psychological demands. This was also mentioned in at least three other studies (Karasek, et al., 1998) and for some authors it is really a measure of control and not of psychological demands. Nevertheless, the scales show acceptable levels of internal consistency, particularly when problematic items are deleted. With respect to the factor analysis, a clear factor pattern is visible that confirms Karasek’s model. It was suggested as useful to compare different formats of the JCQ questions, since this could improve its reliability and sensitivity.

The JCQ-Center has currently initiated several changes to the questionnaire. The JCQ-Center has lead in the development of a “completely consistent and theoretically

updated job stress questionnaire, formatted for easy international comparisons (...). Previous approaches were not sufficient to capture the complex work demand requirements of the global economy and service/information societies.” (Personal e-mail from JCQ-Center received at July 24th 2008). The Center hopes that when the revision is completed 35 countries will use the revised questionnaire.

Characterization of the psychosocial risk factors facing Colombian workers can be made using current version of the JCQ 1.0. However, it is suggested to enrich this characterization by making use of additional measurement methods like other questionnaires (e.g. ERI) and qualitative methods (e.g. observations, interviews) as well (Schoenfeld & Farrell, 2010). This procedure would offer information that facilitates the identification of specific psychosocial factors that characterize the Colombian occupational groups, but can also be used to introduce some modifications or questions in the JCQ-questionnaire that improve its reliability and sensitivity to the working conditions of this population. Some qualitative methods that follow the conceptual proposal of the Demand-Control Model or incorporate elements of it have shown its utility to “assess job characteristics over a working life” (Landsbergis, Schnall, Pickering & Schwarz, 2002) or attempt to describe the burden of work processes upon the human being.

The comparison of the scale means of the Colombian groups with those of other countries demonstrates that our findings are quite similar to those observed elsewhere. Differences between groups were observed. The nurses perceive high demands, but also high control. The bus drivers perceive less demands and control and less social support, compared to the other groups. Other results were unexpected by us; for example, the biggest difference between the Colombian samples and those of other countries was in Job insecurity. The Colombian workers perceived the lowest security in their jobs. Recently published data from Brazil (Araujo & Karasek, 2008) presented higher insecurity means as those of European, US and Mexican samples. But they are lower than those obtained in the Colombian groups. These results are apparently signaling that the insecurity at work is one of the most serious psychosocial factors they perceive.

The validity of the test scores was shown by correlating the subscale values with those of the General Health

Questionnaire. As mentioned previously, some mental health difficulties were shown to be significantly predictable based on individual subscales of the JCQ and on the imbalance between demands and control; the results presented in this paper supports an association between psychological distress and job strain. The observed correlations between the measured psychosocial factors and the health indicators in nurses were unexpected and counter-intuitive. Previous studies in Colombia show that the effects of job strain are worse (blood cholesterol and depression) for nurses that act as assistants (Leguizamón & Gómez, 2002). In fact, in this previous study, when we calculate the correlations separately for assistants and not assistants, the first group showed very high negative associations between anxiety and decision authority and with control and positive correlations with job strain. The not assistants, on the other side, show some correlations in the expected direction between anxiety and somatic symptoms, especially with demands, support from supervisor and job insecurity, but none of them was higher than $r=.22$. We believe that more studies with this population are needed. A number of previous research results have showed that nurses are affected by job strain and the most consistent results indicated that they have increased risk of burnout (i.e. Aiken, Clarke, Sloane, Sochalski, & Silber, 2002; Poncet, Toullic, Papazian, Kentish-Barnes, Timsit, Pochard, Chevret, Schlemmer, & Azoulay, 2006).

The evaluated characteristics of the JCQ in a number of studies indicate that it is a satisfactory instrument to assess and measure the psychosocial work factors of different occupations and to predict some health problems. It has been translated with success to many languages and has been used in different countries. These reasons are enough to suggest that, in spite of its deficiencies, it is worth to use it with workers in developing countries. This would also offer the opportunity to compare occupational groups and the work conditions of different countries.

The relatively small sample sizes of the Colombian groups, and the fact that some of the groups were composed of workers of only one sex, invite caution about the overall interpretation of these results. Nevertheless, because of its psychometric properties (acceptable level of internal consistency, a clear factorial pattern that confirm Karasek's demand-control model, good concurrent and predictive validity), it is suggested that there could be a more extensive application of the Spanish JCQ questionnaire

with Colombian and other Latin-American workers, using different occupational samples and health indicators.

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