

# Assessment of Psychosocial Stressors at Work: Psychometric Properties of the Spanish Version of the ERI (Effort-Reward Imbalance) Questionnaire in Colombian Workers

## Evaluación de Estresores Psicosociales en el Trabajo: Propiedades Psicométricas de la Versión Española del Cuestionario ERI (Effort-Reward Imbalance) en Trabajadores Colombianos

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**Abstract.** In this study, a Spanish version of the ERI questionnaire was tested in Colombia. Cross-sectional studies were performed among two groups of teachers (251 and 318), 294 nurses, 281 bus drivers, and two mixed occupational groups (661 and 117 participants). The internal consistency and the factorial, concurrent and predictive validity of the instrument were examined. Mean values and standard deviations of the Colombian workers were compared to each other and then to averages available for similar workers from two other countries. Based on the results on six groups of Colombian workers presented in this article, it can be said that the Spanish version of the ERI Questionnaire has shown to be a satisfactory measurement instrument of the psychosocial risk factors at work in Colombia.

*Key words:* Effort-Reward Imbalance model, ERI, psychometric properties, occupational stress, psychosocial factors.

**Resumen.** En este estudio, una versión española del cuestionario ERI fue examinada en Colombia. Estudios cross-seccionales fueron llevados a cabo en dos grupos de profesores (n=251 y n=318), uno de enfermeras (n=294), uno de conductores de autobús (n=281) y dos grupos ocupacionales mixtos (n=661 y n=117). También se examinaron la consistencia interna, y la validez factorial, concurrente y predictiva del cuestionario. Los valores medios y las desviaciones típicas de los trabajadores colombianos se compararon entre sí y con los promedios disponibles de trabajadores similares de otros dos países. Sobre la base de los resultados de los seis grupos de trabajadores colombianos, puede decirse que la versión española del ERI ha demostrado ser un instrumento de medida satisfactorio de los factores de riesgo psicosocial en el trabajo en Colombia.

*Palabras clave:* modelo de desequilibrio esfuerzo-recompensa, ERI, propiedades psicométricas, estrés ocupacional, factores psicosociales.

Psychosocial factors at work seem to be one of the most important causes of job-stress. Two main models are currently used in the occupational context in the U.S. and European countries to evaluate psychosocial factors at work: the Demand-Control-Support (DCS) model (Karasek, Gardell, & Lindell, 1987) and the Effort-Reward Imbalance (ERI) model (Siegrist, 1996, 2002). Much research has been advanced based on these theoretical approaches and the instruments supported by them. Since the models and instruments were constructed and applied primarily in economic developed countries, there are still questions about their usefulness in some developing countries. The process of evaluation of the psychometric properties of the Spanish versions of these instruments is still

incomplete. More applications to different occupational groups of various Spanish speaking countries are needed to confirm the psychometric characteristics of the instruments and to improve deficiencies that could be detected on them. Additionally, Latin-American countries like Colombia need validated instruments that allow them to evaluate their workers in order to prevent or intervene potential noxious psychosocial factors at work. At the moment there are not such kinds of instruments available. The purpose of this paper is to report data about the reliability and validity of a Spanish version of the ERI applied to Colombian workers.

Houtman, Jettinghoff, and Cedillo (2007, p. 1) affirm that 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

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traditional values, the reorientation of the occupational health system, and generally poor working conditions". The focus of Occupational Health and Safety initiatives in most economic developing countries has been traditionally on chemical, biological and physical exposures, while the psychosocial risks at work have been largely neglected and their causes and consequences still insufficiently understood. Houtman, Jettinghoff, and Cedillo (2007) believe that the current division between working conditions and the (physical) work environment makes the identifications of the psychosocial risks at work harder for most of the Occupational Health and Safety professional. Not surprisingly very little research on the magnitude of causes and consequences of work-related psychosocial stress is available from these countries.

A different difficulty for the assessment of psychosocial factors at work derives from the fact that the theoretical models and instruments related with these factors, like the ERI model and its measurement instrument, were developed in English and German and primarily applied in countries with high economical development for jobs among men. Because of cultural and socio-economic level of development differences among countries, problems could be expected in applying the ERI in worker populations from countries different from the ones in which it has proved to be sensitive. These differences can determine individuals' values and perceptions. Therefore, what is stressful for one person in a given country may not be as stressful for another in a different country (Lazarus, 1999). 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.

To have the possibility of assessing the magnitude of psychosocial stressor in countries like Colombia, and most important to retain the possibility of comparing the results with those of the countries in which it has been measured for longer periods of time, it is necessary to examine the psychometric properties (e.g., the reliability and validity) of the newly developed Spanish versions of these questionnaires. This paper reports data about the reliability and validity of a Spanish version of the ERI model questionnaire applied to Colombian workers.

The ERI model, as a model of the person-environment interaction in the organizational context, has a basic notion which is that the crucial link between self-regulatory functions such as self-esteem and self-efficacy and the social opportunity structure is established by the work role in adult life. "In particular, the availability of an occupational status is associated with recurrent options of contributing and performing, of being rewarded or esteemed, and of belonging to some significant group (e.g. work-colleagues). Yet these potentially beneficial effects of the work are contingent on a basic prerequisite of exchange in social life,

that is, reciprocity" (Siegrist, 1996, p. 192). Lack of reciprocity is frequent under the following conditions: a) lack of alternative choice in the labor market; b) strategic choice, or anticipatory investments in order to increase future promotion prospects, and c) overcommitment, which is a motivational pattern of excessive work-related performance and achievement that may be part of a person's psychological profile or result from a competitive work environment.

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. 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".

Much prior research has been conducted based on this theoretical approach. Fahlen, Peter, and Knutsson (2004, p. 82) affirm that "Five studies with cardiovascular outcomes, four cohort studies and one cross-sectional study and several cross-sectional studies concerning other outcomes, such as musculoskeletal and psychiatric disorders and subjective health, support the ERI model". Overviews of some of the health effects studied in relation to the ERI can be found in Belkic, Landsbergis, Schnall, Baker, Theorell, Siegrist, Peter, and Karasek (2000); Marmot, Theorell and Siegrist (2002); Peter (2002); Peter & Siegrist (1999); Siegrist (2002, 2005); and Van Vegchel, de Jonge, Bosma and Schaufeli (2005). Effort-Reward imbalance predicted the incidence of coronary heart disease in male and female participants in the Whitehall II study with a mean follow-up of 11 years (Kuper, Singh-Manoux, Siegrist, & Marmot, 2002) and has been associated with cardiovascular mortality in a Finnish study with 25 years of follow up (Kivimäki, Leino-Arjas, Luukkonen, Riihimäki, Vahtera & Kirjonen, 2002). These are some recent findings from prospective studies. The web page of the Medical Sociology Department of the Düsseldorf University (<http://www.uni-Duesseldorf.de/medicalsociology>) offers a number of references supporting relationships of the ERI with health effects like cardiovascular risk and diseases (including Type-II-diabetes), psychiatric disorders, negative symptoms and subjective health, burnout,

deviant behavior, sickness absence, and job dissatisfaction.

The ERI questionnaire has been translated from the original German to Chinese, Korean, Dutch, Danish, French, Japanese, Czech, Finnish, French, Italian, Norwegian, Polish, Portuguese, Russian, Spanish, Swedish, and English languages. A group of selected studies (Eum, Li, Lee, Kim, Paek, Siegrist, & Cho, 2007; Li, Yang, Chen, Siegrist, & Cho, 2005; Salavecz, Neculai, Rózsa, & Kopp, 2006; Weyers, Peter, Boggild, Jeppesen, & Siegrist, 2006) that evaluated psychometric properties and validities of the Korean, Chinese, Hungarian, and Danish instrument were reviewed here. In general, the studies showed appropriate internal consistencies of the three scales: effort, reward, and overcommitment. Cronbach's 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.

Evidence of discriminant validity was obtained from cross-correlations of the scales and from their correlations with gender and education. Predictive validity was obtained by correlations of the effort-reward ratio with physical and mental illness, job dissatisfaction, indicators of self-rated health, psychological well being, gastrointestinal and cardiovascular complaints, depressive symptoms, general well-being, psychosomatic symptoms, and self-assessed health. High overcommitment was significantly associated with more mental illness, poor psychological well-being, and more gastrointestinal and cardiovascular complaints.

A Spanish version of the ERI-questionnaire was evaluated by Macías, Fernández, Hernández, Cueto, Rancaño and Siegrist (2003). They reported that the internal consistency was satisfactory for the scales reward and intrinsic effort, and Cronbach's alpha coefficients higher than 0.80 were observed. On the other hand, the internal consistency for the scale of extrinsic effort was lower ( $\alpha = 0.63$ ). As expected, a three-factor solution was obtained for the factor analysis of reward and a one-factor solution for the factor analysis of intrinsic effort. However, the factor analysis for the scale of extrinsic effort did not show the expected one-factor solution and instead a two-factor solution was obtained. Another study with the same instrument reported a confirmatory factorial analysis in which the structure of the original version was confirmed and the Cronbach's alphas were between 0.75 and 0.85 (Fernández-López, Martín-Payo, Fernández-Fidalgo & Rödel, 2006).

The questionnaire evaluated in Spain, with some minor wording changes, was the same as the one used in Colombia. The present paper sets out to test the psychometric properties of the Spanish version of the ERI 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 six different Colombian samples (nurses, bus drivers, two of teachers, and two mixed occupational groups).

## Method

### Participants

The six samples studied were 294 nurses (women, Mean age 36, *SD* 9.79; 5-year average work experience); 281 bus drivers (men, Mean age 40, *SD* 8.3; 5-year average work experience); 251 teachers of private schools –teachers group 1– (Mean age 35.4, *SD* 8.3; 9-year average work experience); 318 teachers of private (133) and public (185) schools –teachers group 2– (Mean age 36, *SD* 9; 6.8-year average work experience); a group of 661 participants with mixed occupations - mixed occupational group 1- (302 men and 357 women; Mean age 31, *SD* 9.8; 5.4-year average work experience; include participants of the full occupation spectrum -belonged to the private and public sectors of Colombia, were managers, professional, educator, clericals, service, white-collar and blue-collar workers and supervisors-); and 117 persons with mixed occupations –mixed occupational group 2– (Mean age 50, *SD* 7.53; 104 men and 13 women; 14.9-year average work experience; include participants of the full occupation spectrum -belonged to the private and public sectors of Colombia, were independent workers, managers, professional, educator, clericals, service, white-collar and blue-collar workers and supervisors-). The total sample was constituted by 1922 workers.

### Instruments

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, total score: 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 her or himself distressed; (5) does apply and subject considers herself and 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 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 5 items (5/11) and 0.5454 if it contains 6 items (6/11). As a 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.

An official Spanish version of the JCQ (27 items) was used to measure a second psychosocial factor at work in order to evaluate the concurrent validity of the ERI. It includes the following scales and number of items: (1) decision latitude is composed of two subscales, job skill discretion (6 items) and job decision-making authority (3 items); (2) job demands (5 items); (3) supervisor support (4 items); (4) co-worker support (4 items); (5) job insecurity (4 items); (6) physical job demands (1 item). Answer choices for every question were presented on a 4-point Likert-type scale. Using the values of demands, job decision-making and decision latitude is possible to calculate a continuous value that indicates “job strain”. Cronbach’s alpha values for different scales of the JCQ in the Colombian samples oscillate between 0.4 and 0.8.

Health was assessed in these samples using a Spanish version 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 4-point Likert-type scale that ranged from 1= no, absolutely to 4= more than habitual. The Cronbach’s alpha for the four scales in all the samples oscillate between 0.7 and 0.88.

### Procedure

Data were gathered in cross-sectional studies, utilizing a self-administered survey instrument, after informed consent was obtained from each subject. The participants selection was non probabilistic as all members of the target populations were invited to participate through personal letters or internal communications of their organizations. Participations rates were excellent and varied between 80% and 90%. Questionnaires were coded with numbers to protect the identities of the participants. Means, standard deviations and internal consistency (Cronbach alpha) of each scale were calculated and compared between the samples and with the results from studies in other

Spanish speaking countries (Spain and México). The construct validity was evaluated with exploratory factor analysis using the data of the aggregated groups. The principal component method was used. The components were orthogonally rotated using varimax procedure. Factor loadings equal to or larger than .40 were accepted as sufficient. Finally, to test the external validity, concurrent and predictive validity of the instrument were also studied and compared between the Colombian samples. For the concurrent validity, the ratio of imbalance between effort and rewards was correlated to the job strain value of each person, a related construct, obtained with the Job Content Questionnaire (JCQ). The most similar subscales of the questionnaires, the Effort (ERI)- and de Job Demands (JCQ)-scales, were also correlated. The predictive validity was calculated correlating the value of each ERI subscale and the Imbalance score with the subscales and total score of the General Health Questionnaire (GHQ-28).

### Results

Table 1 shows mean values on the subscales and on the Imbalance (Ratio) score of the Colombian groups and of two other Spanish speaking groups<sup>1</sup>. There are differences on effort between samples, some of them significant: effort is the highest in the Colombian teachers ( $p < 0.1$ ) and in the Spanish health workers. The lowest effort were reported by the Colombian mixed occupational groups ( $p < 0.1$ ) and by the Mexican mixed occupational group.

Overcommitment is the highest in the teachers ( $p < 0.1$ ) and the lowest in the Mexican workers. Rewards means are very different between groups. The lowest was founded in the Colombian drivers ( $p < 0.1$ ), as expected, and the highest in the Colombian mixed occupational group 2 ( $p < 0.1$ ) and in Mexican mixed occupational group. It is interesting to point out that the Colombian teachers are groups reporting high effort but also high rewards. The Colombian drivers, on the contrary, report low effort but also low reward. These two Colombian groups (teachers and drivers) seem to be the most stressed according to the imbalance ratio.

As can be seen in Table 2, the Cronbach’s alpha coefficients for all scales and samples of Colombians are acceptable. They varied between 0.71 and 0.87. When the data of all the Colombian groups are merged together the internal consistency of the three scales is very good, as can be seen in Table 3. In fact, the internal consistency for both effort and reward was higher

<sup>1</sup> The Spanish health workers were 233 physicians and nurses; the Mexican mixed occupational group was composed by 873 workers from different occupations. 36% of the sample made up of men whereas 64% was integrated by women.

Table 1. Means and Standard Deviations Obtained by the Groups in the ERI

ERI Scales Groups	Effort	Reward	Overcommitment	Ratio*
Teachers 1 <sup>1</sup>	17.6 (5.5)	43.7 (8.7)	18.0 (4.1)	0.74
Teachers <sup>2</sup> >	17.6 (5.5)	41.9 (9.1)	16.4 (4.7)	0.77
Nurses <sup>3</sup>	14.9 (5.0)	43.7 (9.5)	14.3 (3.3)	0.63
Drivers <sup>3</sup>	15.1 (6.1)	28.9 (3.8)	15.3 (3.9)	0.96
Mix. Occup. 1 <sup>4</sup>	14.3 (4.5)	39.8 (10.9)	14.5 (2.9)	0.66
Mix Occup. 2 <sup>5</sup>	13.1 (0.4)	46.6 (8.5)	14.7 (3.3)	0.51
Spanish health workers <sup>6</sup>	16.0 (4.3)	38.0 (8.6)	15.6 (5.0)	0.77
Mexican mix. Occup. <sup>7</sup>	12.3 (4.2)	46.4 (7.3)	12.8 (3.0)	0.49

<sup>1</sup>Moreno, 2008; <sup>2</sup>De la Torre, 2007; <sup>3</sup>Arango, 2007; <sup>4</sup>Marulanda, 2007; <sup>5</sup>Pérez, 2004; <sup>6</sup>Macías et al, 2003; <sup>7</sup>Camacho-Avila et al, 2008.

\*The ratio was calculated using the formula:  $e/r*c$  where 'e' is the sum score of the Effort scale, 'r' is the sum score of the reward scale and 'c' defines a correction factor for different numbers of items in the nominator and denominator. The correction factor used in all the samples was 0.5454 because all them answered 6 items (6/11)

Table 2. Cronbach's Alpha Coefficients of the ERI Scales in Different Groups

ERI Scales Groups	Effort	Reward	Overcommitment
Teachers 1 <sup>1</sup>	0.80	0.80	0.80
Teachers 2 <sup>2</sup>	0.77	0.83	0.82
Nurses <sup>3</sup>	0.80	0.86	0.75
Drivers <sup>3</sup>	0.81	0.85	0.71
Mix. Occup. 1 <sup>4</sup>	0.73	0.87	0.72
Mix Occup. 2 <sup>5</sup>	0.74	0.85	0.71
Spanish health workers <sup>6</sup>			
Men	0.66	0.81	0.80
Women	0.62	0.80	0.82
Mexican mix. Occup. <sup>7</sup>	0.70	0.83	0.58

<sup>1</sup>Moreno, 2008; <sup>2</sup>De la Torre, 2007; <sup>3</sup>Arango, 2007; <sup>4</sup>Marulanda, 2007; <sup>5</sup>Pérez, 2004; <sup>6</sup>Macías et al, 2003; <sup>7</sup>Camacho-Avila et al, 2008.

Table 3. Statistic Analysis of the Individual Items

ERI Items in Spanish	Average	Standard deviation	Symmetry	Cronbach alpha (total sample)	Corrected item-total correlation
<b>Eri 1</b> Trabajo a un ritmo muy apurado	2.9	1.3	-0.8		0.7*
<b>Eri 2</b> Interrupciones	2.3	1.3	0.4		0.5*
<b>Eri 3</b> Responsabilidad	3.3	1.1	0.2		0.4*
<b>Eri 4</b> Trabajar más tiempo del estipulado	2.6	1.5	0.3		0.6*
<b>Eri 5</b> Esfuerzo físico	2.0	1.2	0.8		0.4*
<b>Eri 6</b> Cada vez más trabajo	2.6	1.4	0.2		0.7*
<b>EFFORT</b>	<b>15.5</b>	<b>5.4</b>		<b>0.78</b>	
<b>Eri 7</b> Reconocimiento de superiores	3.5	1.5	-0.4		0.7*
<b>Eri 8</b> Reconocimiento de compañeros	3.5	1.5	-0.5		0.7*
<b>Eri 9</b> Apoyo necesario en situaciones difíciles	3.5	1.6	-0.5		0.7*
<b>Eri 10</b> Trato injusto	3.5	1.8	-0.5		0.7*
<b>Eri 11</b> Oportunidades de promoción escasas	3.2	1.4	-0.2		0.5*
<b>Eri 12</b> Empeoramiento condiciones trabajo	3.2	1.8	-0.2		0.7*
<b>Eri 13</b> Trabajo en peligro	3.4	1.8	-0.4		0.7*
<b>Eri 14</b> Considerar adecuado el cargo	3.7	1.6	-0.7		0.7*
<b>Eri 15</b> Considerar adecuado reconocimiento	3.4	1.5	-0.3		0.7*
<b>Eri 16</b> Oportunidades de ascender adecuadas	3.4	1.5	-0.4		0.6*
<b>Eri 17</b> Considerar adecuado sueldo	3.2	1.5	-0.2		0.4*
<b>REWARDS</b>	<b>25.7</b>	<b>11.6</b>		<b>0.9</b>	
<b>Eri 18</b> Falta tiempo para terminar trabajo	2.4	0.9	0.1		0.4*
<b>Eri 19</b> Despertar con problemas trabajo en la cabeza	2.5	0.9	-0.1		0.6*
<b>Eri 20</b> Olvidar fácilmente trabajo en casa	2.6	0.9	-0.1		0.6*
<b>Eri 21</b> Personas cercanas dicen que sacrificio mucho por trabajo	2.7	0.9	-0.1		0.5*
<b>Eri 22</b> No poder olvidar trabajo, incluso por la noche	2.5	0.9	0.0		0.6*
<b>Eri 23</b> Cuando aplaza algo no puede dormir por la noche	2.4	0.9	0.1		0.5*
<b>OVERCOMMITMENT</b>	<b>14.9</b>	<b>3.3</b>		<b>0.73</b>	

\* Correlation is significant at the 0.01 level (2-tailed)

among the Colombian samples than among the Spanish or Mexican samples. Table 3 presents the statistical analysis of the items for each scale according to the suggestions of Carretero-Dios & Pérez (2005). The corrected correlation between each item and the scale it belongs to and the scales it does not belong to (data not shown) were also calculated. They showed that each item correlates higher with the first scales than with the seconds. We do not detect psychometric problems with any item. The results presented indicate that the items are homogeneous and the scales have a good internal consistency.

Exploratory factor analyses were conducted with the aggregated data of the groups. The principal com-

ponent extraction method was used. This analysis resulted in five components which explain 60.3% of the variance. Two of these components explain 21 and 15 % of the variance. The components were orthogonally rotated using a varimax solution. Factor loadings equal to or larger than .40 were accepted as sufficient.

The results of the factor analyses suggest that the best factor solution has three factors (Effort -component 2-, Reward -component 1- and Overcommitment -component 4-). The exploratory factor analysis with varimax rotation showed that even if the items of the reward scale converge together, three items of this scale seem to constitute an independent component. However, the total scale has a high internal consisten-

Table 4. Exploratory Factorial Analysis of Principal Components for the Total Sample of Colombian Workers

Eri Items	Component 1	Component 2	Component 3	Component 4	Component 5
Eri 1		<b>0.66</b>			
Eri 2	0.41	<b>0.44</b>			
Eri 3		<b>0.42</b>			0.45
Eri 4		<b>0.65</b>			
Eri 5		<b>0.47</b>			
Eri 6		<b>0.66</b>			
Eri 7	<b>0.69</b>				
Eri 8	<b>0.67</b>				
Eri 9	<b>0.73</b>				
Eri 10	<b>0.72</b>				
Eri 11	<b>0.59</b>				
Eri 12	<b>0.73</b>				
Eri 13	<b>0.69</b>				
Eri 14	<b>0.71</b>				
Eri 15	<b>0.71</b>				
Eri 16	<b>0.70</b>				
Eri 17	<b>0.52</b>		0.57		
Eri 18		<b>0.58</b>			
Eri 19		<b>0.62</b>			
Eri 20				<b>0.41</b>	
Eri 21		<b>0.54</b>			
Eri 22		<b>0.64</b>			
Eri 23		<b>0.46</b>			

Table 5. Exploratory Factorial Analysis with Varimax Rotation for the Total Sample of Colombian Workers

Eri Items	Component 1	Component 2	Component 3	Component 4	Component 5
Eri 1		<b>0.76</b>			
Eri 2		<b>0.64</b>			
Eri 3		<b>0.44</b>			0.56
Eri 4		<b>0.77</b>			
Eri 5		<b>0.50</b>			
Eri 6		<b>0.76</b>			
Eri 7	<b>0.70</b>				
Eri 8	<b>0.77</b>				
Eri 9	<b>0.78</b>				
Eri 10	<b>0.87</b>				
Eri 11	<b>0.40</b>				
Eri 12	<b>0.75</b>				
Eri 13	<b>0.80</b>		0.52		
Eri 14	<b>0.70</b>				
Eri 15	<b>0.49</b>		<b>0.66</b>		
Eri 16	<b>0.49</b>		<b>0.66</b>		
Eri 17			<b>0.79</b>		
Eri 18		<b>0.61</b>			
Eri 19		<b>0.50</b>		<b>0.55</b>	
Eri 20				<b>0.58</b>	
Eri 21				<b>0.49</b>	
Eri 22				<b>0.72</b>	
Eri 23				<b>0.69</b>	
Eigenvalue	6.0	4.3	1.2	1.2	1.0
% var. Expl.	21.5	15.8	9.3	9.0	4.7

Table 6. Correlation between the ERI Scales and the GHQ Scales of the Colombian Workers

ERI Scales Groups	Effort	Reward	Overcommitment	E-R Ratio
<b>Teachers 1</b>				
Social Dysfunction	0.13(*)	-0.09	0.24(**)	0.13
Depression	0.19(**)	-0.18(**)	0.12(**)	0.21(**)
Anxiety	0.60(**)	-0.43(**)	0.68(**)	0.59(**)
Somatic symptoms	0.53(**)	-0.39(**)	0.60(**)	0.52(**)
Total Health	0.56(**)	-0.41(**)	0.65(**)	0.56(**)
<b>Teachers 2</b>				
Social Dysfunction	0.32(**)	-0.18(**)	0.23(**)	0.24(**)
Depression	0.33(**)	-0.26(**)	0.24(**)	0.33(**)
Anxiety	0.60(**)	-0.48(**)	0.56(**)	0.53(**)
Somatic symptoms	0.52(**)	-0.38(**)	0.46(**)	0.43(**)
Total Health	0.63(**)	-0.46(**)	0.55(**)	0.54(**)
<b>Nurses</b>				
Social Dysfunction	0.08	0.03	0.06	0.03
Depression	0.03	-0.11	0	0.05
Anxiety	0.13 (*)	-0.21	-0.04	0.19 (**)
Somatic symptoms	0.15 (*)	-0.15	-0.08	0.20 (**)
Total Health	0.14 (*)	-0.16 (*)	-0.03	0.17 (**)
<b>Drivers</b>				
Social Dysfunction	0.64(**)	0.51(**)	0.57(**)	0.45(**)
Depression	0.11	0.00	0.11	0.13
Anxiety	0.39(**)	-0.14(*)	0.36(**)	0.46(**)
Somatic symptoms	0.22(**)	-0.14(*)	0.33(*)	0.30(**)
Total Health	0.31(**)	-0.15(*)	0.34(**)	0.39(**)
<b>Mixed occup. 1</b>				
Social Dysfunction	0.17(**)	-0.18(**)	0.19(**)	0.17(**)
Depression	0.12(**)	-0.12(*)	0.14(**)	0.10(*)
Anxiety	0.34(**)	-0.17(**)	0.48(**)	0.23(**)
Somatic symptoms	0.28(**)	-0.12(**)	0.35(**)	0.19(**)
Total Health	0.32(**)	-0.18(**)	0.44(**)	0.24(**)

\*p&lt;0.5 \*\*p&lt;0.01

cy and the corrected correlation of each of the items with the total value of the scale is high indicating a good psychometric property of the scale as it is. Item 18 has a higher factorial weight with the scale assessing extrinsic effort that with the scale of intrinsic effort. However once again, a high internal consistency of the scale and a high corrected correlation of the item with the total value of the scale indicate a good psychometric property of the scale. It seems that the scale does not need a change but the item 18 should be observed carefully in other applications of the instrument.

As expected, the correlations with the health indicators of the Colombian samples<sup>2</sup> show that the scales of

<sup>2</sup> We don't have this data for the mixed occupational group 2.

the ERI are positive correlated with the majority of the health indicators in the predicted direction (higher values in the health scales indicate more health problems). In the case of the nurses, the Effort scale and the Effort-Reward ratio were positively correlated only with anxiety and somatic symptoms. These correlation values are low, compared with most of the other data. On the other side, for the groups of teachers, the mixed occupational group 1 and the drivers almost all the correlations were significant. The teachers and the drivers are, according to the ERI, the most stressed groups. As expected, the explained variance of the health problems is higher for these groups than for the others. Even though some of the correlations are significant they are quite low –some .12–, in particular with depression and social adjustment. This means the

explained variance of these health problems is less than 3% but for anxiety and psychosomatic symptoms it can be as high as 46%.

In the samples in which both questionnaires were administered, the “Job Strain” indicator and the effort-reward ratio were positively correlated as can be seen in the Table 7. These correlations indicate that these constructs are measuring closely related phenomena, but that they are not identical. Another option to test the concurrent validity between the ERI and the JCQ is to correlate the two most similar subscales of the questionnaires, which are the Effort (ERI) and the Psychological Demands (JCQ) scales. All the correlations between these subscales were significant and positive (Table 7).

Table 7. Correlations between JCQ and ERI and between Effort and Psychological Demands for all Occupational Groups and the total Sample

Occupational groups	ERI-JCQ	Effort-Psychological demands
Teachers 1	0.6*	0.7*
Teachers 2	0.6*	0.4*
Nurses	0.2*	0.5*
Drivers	0.6*	0.5*
Mixed Occupational group1	0.2*	0.5*
All groups	0.3*	0.5*

\* $p < 0.1$

## Discussion

Overall, the results support the psychometric adequacy of the Colombian version of the ERI questionnaire and its respective subscales. The comparison of the scale means of the Colombian groups with those of other countries demonstrates that mean values and prevalence of exposure to ERI are comparable to those observed elsewhere in similar occupational groups. Some interesting differences between the Colombian groups were observed. We pointed out earlier that the teachers are groups reporting high effort but also high rewards. The drivers, on the contrary, report low effort as well as low reward. Both these groups seem to be the most stressed, as indicated by the ERI score. These groups were also assessed with the JCQ and our resultant “job strain” data coincide with our ERI result to signal the drivers as the workers with the highest job-stress.

Cronbach’s alphas of the scales and the psychometric characteristics of the items were satisfactory. The predictive validity of the test scores was shown by correlating the subscale values with those of the General Health Questionnaire. The results presented in this paper support an association between psychological distress and work stress as it is conceptualized by the Effort-Reward Imbalance model. In fact, the more

stressed groups showed more clearly associations of bad health indicators with experience of high efforts, low rewards, high overcommitment, and high imbalance between effort and rewards.

Some of the observed correlations between the measured psychosocial factors and the health indicators in nurses were significant and in the expected direction. However, compared to the other occupational groups studied, they do not show relationships between the reward and overcommitment scales and any of the health indicators. On the other hand, the social dysfunction and depression of the nurses did not correlate with any of the scales of the ERI. We obtained similar results with other group of nurses using JCQ to measure “job strain”. Previous studies in Colombia showed that effects of “Job strain” are worse (blood cholesterol and depression) for nurses aides (Leguizamón & Gómez, 2002). We do not have enough data in this group of nurses to compare the aides against the not aides. 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 (e.g. Aiken, Clarke, Sloane, Sochalski & Silber, 2002; Poncet, Toullic, Papazian, Kentish-Barnes, Timsit, Pochard, Chevret, Schlemmer & Azoulay, 2006). On the other side, the significant and positive correlation between the social dysfunction and the work rewards ( $r=0.51$   $p<0.1$ ) of the drivers was unexpected and has no clear explanation. Further studies will be needed to clarify this result.

One interesting possibility facing the previous described results is that the health consequences of the imbalance between effort and rewards or of overcommitment could not be the same for different occupational groups. From our data it could be offered the hypothesis that ERI predicts better anxiety and psychosomatic symptoms than depressive symptoms and social dysfunction. And these problems seem to be more pronounced in teachers and drivers than in other groups.

Finally, the factorial structure of the scales measuring the components of the theoretical concept was replicated satisfactorily: effort, rewards and overcommitment. The three components of the reward subscale have not a clearly distinction but the total subscale seems to be evaluating just the reward present in the working conditions. Finally, the item 20 (forget easily work at home), which should be associated to the items evaluating overcommitment, is not showing a good factor loading on this component. This item loads better in the effort component. This result could be indicating that this item assess more effort than overcommitment; other explanation is that because it is the only item of the scale which is formulated in a positive direction it can be misunderstood. We do not know about other studies with a similar result.

The evaluated characteristics of the ERI in a number of previous 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, has been used in different countries and has demonstrated strong predictive validity with regard to a number of health outcomes. The high reliability and validity of the ERI used elsewhere, coupled with the good psychometric characteristic the questionnaire displayed in the Spanish version used in Colombia, suggests that it is worth using the ERI with workers in developing countries like ours. This further use would offer the opportunity to compare both occupational groups and working conditions within Colombia and between different countries especially in Latin America.

The samples sizes but specially the lack of more occupational variance, limited gender and class info in the Colombian groups 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 the original model; good concurrent and predictive validity) it is suggested that there be a more extensive application of the Spanish ERI questionnaire with Colombian and other Latin-American workers, evaluating different occupational samples and health indicators.

Based on the results on six groups of Colombian workers presented in this article, the measurement properties of the Spanish ERI questionnaire with Colombian samples are acceptable and comparable to those described for the original and other versions used in other languages and countries. We conclude that the Spanish version of the Effort-Reward Imbalance Questionnaire has shown itself to be a satisfactory measurement instrument of the psychosocial risk factors at work.

Characterization of the related psychosocial risk factors facing Colombian workers can be made using the current Spanish version of the ERI. However, this characterization would be greatly enriched using additional measurement strategies such as additional questionnaires (e.g. JCQ to measure "Job Strain") as well as qualitative methods (e.g. observations, interviews) (Landsbergis, Schnall, Pickering & Schwarz, 2002; Schonfeld & Farrell, 2008). Using multiple procedures would allow for "triangulation" of exposures and outcomes and facilitate the identification and description of specific psychosocial factors that affects different Colombian occupational groups.

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