Validity of the Effort/Reward Imbalance Questionnaire in Health Professionals From Six Latin-American Countries

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Background *This study tests the validity and the invariance of ERI questionnaire (ERIQ) data from health professionals in six different Latin-American countries.*
Methods *One thousand two hundred ninety-two (1292) participants who worked in hospitals in Argentina, Chile, Colombia, Mexico, Peru and Venezuela completed the ERI and GHQ questionnaires. Partial correlations were carried out as well as reliability statistics and confirmatory factor analyses to examine factor structure and invariance of ERIQ in each subsample.*
Results *Overall confirmatory factor analyses confirmed the theoretical structure of the ERIQ. The effort and overcommitment scales were invariant (equivalent) across the six countries, but the reward scale was only partially invariant. Several associations between ERIQ and mental health remain significant after controlling for sociodemographic variables.*
Conclusions *Although the validity of the ERIQ' scales were generally satisfactory in most Latin-American samples, future research should examine in depth the equivalence of reward scale across Latin-American cultures. Am. J. Ind. Med.*

KEY WORDS: effort; reward; ERI; Latin-America; health professionals

INTRODUCTION

The role of work organization and psychosocial work factors in health disorders and mental illness is substantial. An extensive body of research and recent systematic reviews have concluded that psychosocial and work stress related factors are likely the cause of several negative outcomes such as poor health behaviors, musculoskeletal disorders, heart diseases, metabolic dysfunctions, and different mental and physical problems [Bonde, 2008; Eller et al., 2009; Leka and Jain, 2010].

The scientific literature for psychosocial factors at work consistently shows two major models as the most influential in demonstrating an impact on health through stress mechanisms: these are the Demand/Control or Job strain Model (DC) [Karasek, 1976] and the Effort/Reward Imbalance Model (ERI) (Siegrist, 1996). The ERI model,

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unlike the DC model, focuses on rewards as a key work stressor and was formulated more recently.

Siegrist (1996) proposed the ERI model to explain the adverse effects of core psychosocial factors at work on health; it particularly focuses on the imbalance between effort and reward at work as an important mechanism of workers' stress experience. Regarding the effort component, two subdimensions are considered: (i) extrinsic effort, which represents job demands and/or obligations that are imposed on an employee, such as time pressure and working overtime, and (ii) intrinsic effort, which assumes an individual difference among employees characterized by a motivational pattern of excessive job-related commitment and a high need for approval (i.e., overcommitment). Although overcommitment remains important in the ERI model, most studies have focused on the combination of high extrinsic effort and low reward as a core hypothesis of the model [van Vegchel et al., 2005]. Reward is defined as money, esteem, and job security/career opportunities that an employee receives at work. Thus, the core prediction of the model is that employees chronically exposed to working conditions of high effort (costs) and low rewards (gains) at work will suffer from particularly harmful psychosocial effects characterized by low reciprocity, which may lead to emotional strain and stress-related physiological reactions [Siegrist, 1996].

Originally, a 23-item questionnaire (effort-reward imbalance questionnaire: ERIQ) was proposed to assess effort and reward characteristics in the workplace [Siegrist et al., 2004]. In 2007, items ERI 7 (respect from superiors) and ERI 8 (respect from colleagues) were merged into a single item in order to include self-employed or small business proprietors, thus the last long version consists of 22 items [Siegrist, 2013]. More recently, a short version of the ERIQ with 16 items was developed and reported satisfactory psychometric properties [Siegrist et al., 2009]. In addition to the German version, the ERIQ has been translated into other languages, such as Greek [Msaouel et al., 2012], Italian [Magnavita et al., 2012], Chinese [Li et al., 2012], Swedish [Leineweber et al., 2010], Japanese [Tsutsumi et al., 2001] and Spanish [Fernández-López et al., 2006].

Nevertheless, the vast majority of the psychometric studies of the ERIQ have been conducted in developed countries, mainly in Western Europe [van Vegchel et al., 2005] where job conditions are better than those in developing nations, such as Latin-American countries. According to ILO (2012), Latin-America has important shortcomings in working conditions and is characterized by precarious employment. For instance, Colombia, Mexico and Peru are among the countries with the lowest wages in the Global Wage Report [ILO, 2013], the highest work overtime [ILO, 2007], and the longest daily work hours [OECD, 2011]. Consequently, effort-reward imbalance may be an important psychosocial risk in this region. The World Health Organization [WHO, 2007] has pointed out that while globalization and changes in the nature of work are probably worsening work-related stress issues in Latin-America, there are neither enough studies nor mandatory rules or risk standards related to good practices in the psychosocial risks exposures.

Particularly, ERI model and ERIQ, whether for research or practical purposes, remain relatively little known in most of Latin-American countries, so the validity of ERI in this region is yet to be established. Some notable exceptions are the studies carried out in Brazil [Chor et al., 2008; Griep et al., 2009], Colombia [Gómez, 2011], and Venezuela [Díaz and Feldman, 2010]. In general, these studies have shown that the ERIQ has adequate psychometric properties in health professional samples. However the studies had several limitations: only one of the studies (the Portuguese and not the Spanish version) used confirmatory factor analyses, which allows a stronger way to confirm theoretical assumptions in comparison to exploratory factor analyses; the sample sizes of the studies were small (less than 300); none of the studies addressed whether the factor structure and factor loadings of the ERIQ items remain invariant across different Latin-American samples, which will be an important prerequisite for an international comparison of working conditions using the ERIQ between Latin-America countries; and none of the studies tested the associations of ERI scales with health outcomes after controlling for several sociodemographic variables.

Given the important evidence of the ERI model in developed countries and its implications for preventive programs of stress in health professions, the generalizability and cross-cultural validity of ERIQ needs to be examined in other regions, such as Latin-America. Thus, the purpose of this study was to examine the validity of ERIQ data from health professionals in six Latin-American countries (Argentina, Chile, Colombia, Mexico, Peru, and Venezuela) and to test whether the factor structure and factor loadings of the ERIQ items are invariant across the six countries.

METHODS

Participants

Data from Argentina, Chile, Colombia, Mexico, Peru, and Venezuela were collected between 2008 and 2012 as initial collaborations in the Latin-American Network of Researchers on Psychosocial Factors at Work (RIFAPT in Spanish). A principal investigator in each country defined and recruited target populations through convenience sampling from different public and private hospital settings. Once health organizations were identified, employees were invited to participate through personal letters or internal communications within their organizations. On average, 80% of the survey participants who volunteered for the study in all of the six samples completed the survey. No information on the total number of health professionals in each hospital could be

obtained. Overall, a global sample of participants (n = 1292) was completed. The Latin American sample was made up of paramedics, physicians, occupational and physical therapists, technical personnel, and mainly nurses (57.4%) (Table I).

In most Latin-American countries there are not National Institutional Review Boards for ethics procedures as there are in some developed countries; however a number of health institutions and Universities have small boards in order to do this review. This study was carried out under Helsinki declaration principles and all participants signed an informed consent and were invited with the authorization of management within each hospital and/or from the respective ethics committees in each country: the Universidad de Tucumán (Argentina), Scientific Committee of FUCYT Chilean Association of Security (Chile), Universidad de los Andes (Colombia) (Psychology department), Red RIMAC (Perú), Universidad Central de (Venezuela) (Medicine school), Universidad Autónoma del Estado de Morelos, Mexico (Psychology department).

Measurements

Based on cross-sectional studies, factor validity (factor structure and multi-group invariance analyses) and convergent validity (expected relationship with health criteria) were carried out.

ERI Questionnaire

The original 23-item Spanish version of the ERIQ [Fernández-López et al., 2006] was used. No modifications or adaptations were made except for the Mexican version, where items ERI 1 ("*I have constant time pressure.*."), ERI 11 ("*My job promotion prospects are poor*") and ERI 13 ("*My employment security is poor*") were adapted for the better understanding of Mexican employees. The wording of these items in Spanish ("from Spain") is interpreted differently in Mexico. Back-translation procedures were used for the modified ERIQ items in the Mexican version and semantically validated by two health professional workers and two Mexican researchers experienced in psychosocial factors at work. ERIQ includes three scales measuring extrinsic 'effort' (six items), 'reward' (eleven items with three subscales 'esteem', 'salary and promotion prospects' and 'job security'), and intrinsic effort ['over-commitment' (OC)] (six items). As indicated in its original version, items measuring the reward and extrinsic effort components were answered in two steps. First, participants agreed or disagreed whether or not the item content describes a typical experience of their work situation. Subsequently, persons who agreed were asked to rate the degree of experienced distress on a 4-point Likert scale worded 'I am not at all distressed', 'I am somewhat

TABLE I. Sample Characteristics

COUNTRY	Health profesional group	N	Age (Mean ± SD)	Sex (% Women)	Education (% college or graduate studies)	Marital status (% married or cohabiting)
Argentina (Córdova)	100% Nurses	104 from a public hospital	41.04 ± 9.09	74.8	60.4	54.8
Chile (Santiago)	100% Nurses	67 from two public and one private hospitals	48.00 ± 11.38	92.5	0 (100% technical studies)	64.6
Colombia (Bogotá)	100% Nurses	294 from a public hospital	36.98 ± 9.80	88.7	38	Not available
México (México)	76.70% Nurses 23.30% Physicians	322 from two public hospitals	40.16 ± 9.84	76.9	40.7	62.7
Perú (Districts around Lima)	17.15% Nurses 42.28% Physicians 40.57% Other	175 from diferrent public hospitals	43.01 ± 8.26	56.6	66.3	67.4
Venezuela (Caracas)	100% other (therapists)	330 from different public and private health centers	34.03 ± 9.73	79.1	23.7	37.8

distressed', 'I am distressed,' and 'I am very distressed'. Although we are aware that the two-step response set has changed to a one-step response set with only four response options [Tsutsumi et al., 2008; Siegrist, 2013], we used the former procedure because during the data collection period of this study the one step Likert scale version was still being tested for use.

The calculation of an effort to reward ratio has been suggested in order to test the major hypothesis of the ERI model [Siegrist et al., 2004]. Thus, theoretically it is expected that ERI ratio has the stronger associations with mental health indicators than its component scale (i.e., effort or reward scale). The range of the 'effort' scale is 6–24, with higher values indicating increased effort while the reward scale ranges from 11 to 44 with smaller values indicating low reward (after recoding). The ratio formula was calculated by dividing effort scores by reward scores —the latter was multiplied by a correction factor of 0.5454 to adjust for the unequal number of items in both scales (R effort/[R reward · 0.5454]) [Siegrist, 2013], this algorithm gives an approximate quantitative estimate of the mismatch between costs and gains at work.

GHQ Questionnaire

As evidence of convergent validity, the association between ERI and mental health status was examined. Mental health status was assessed using the Spanish version of the General Health Questionnaire (GHQ-28) [Goldberg and Hillier, 1979], a self-administered screening instrument designed to detect psychological disorders. The GHQ-28 has proven to be a simple and valid instrument for detecting mental disorders in both the clinical and non-clinical settings. According to Goldberg's method [Reid, 1973], the four response options (1–2-3–4) were converted to 0–0-1–1 scores, respectively. A total scale score was calculated by adding up these converted scores for each person, with higher scores indicating greater mental health problems. The GHQ-28 provides additional information based on the following four sub-scales: somatic symptoms, anxiety/insomnia, social dysfunction, and severe depression. Previous validity analyses have confirmed its four-factor structure and its adequate sensitivity and specificity in Hispanic and Latin American populations [Medina-Mora et al., 1983; Lobo et al., 1986]. Although the total score of GHQ is traditionally used as general indicator of mental health, sub-dimension analyses are intended for studies in which an investigator seeks more specific information [Goldberg and Hillier, 1979], such as particular patterns or mechanisms associated with mental health. We believe specific validity exploration of ERI subscales considering this option would be more informative. Thus, both the total score and the sub-dimensions scores were used in this study.

Data Analyses

Data analyses were performed in four stages: in the first stage, scale reliability (Cronbach's alpha) and confirmatory factor analyses (CFA) using maximum likelihood method were carried out separately within each country and in the global sample. CFA was performed to test the dimension structure of the theoretical model as has been done in previous psychometric ERI studies [Siegrist et al., 2004; Fernández-López et al., 2006; Weyers et al., 2006]. To test the goodness of fit of a statistical model, the most common indices in the literature and according to suggestions by West et al. (2012) are X^2/gl ratio, GFI (goodness of fit index), CFI (comparative fit index), RMR (root mean square residual) and RMSEA (root mean square error of approximation). These were all calculated since they have desirable properties: they are not related to sample size and they are suggested for cross-sectional studies [Schreiber et al., 2006]. Satisfactory values for the goodness of fit of a statistical model are: lower than five for the X^2/gl ratio, lower than 0.10 for RMR and RMSEA, and greater than 0.90 for all other indices [Kelloway, 1998].

In the second stage, in order to investigate an invariance of the factor structure and factor loadings of ERIQ items between countries, we carried out a multigroup factor analysis of invariance for each scale (effort, reward, and overcommitment) among the six samples. The main advantage of multiple group analyses is that it allows for the estimation of distinct parameters simultaneously in different groups. Additionally, to test invariance, the fit of this estimated simultaneous model can provide the baseline value against all subsequently specified models which are compared when equality constraints are imposed on particular parameters. This method has a clear advantage over single group analyses where no between-group constrains are involved and fit values yield on specific-group statistics [Byrne, 2010]. Thus, in line with other differential item functioning techniques (DIF), the invariance analyses using multiple confirmatory analyses allow exploring whether an instrument is not group-specific. Specifically, we tested structural (same factor structure) and metric invariance (equivalent factor loadings). To test structural (or configural) invariance, the only invariance constraint was that the exact same parameters were tested for the six national groups, while all these parameters were freely estimated. To test for metric invariance, we tested a model where factor loadings were also constrained to be the same across the national groups. As suggested by Byrne (2010); the evidence of non-invariance when comparing groups is based on the X^2 difference test (ΔX^2) and the CFI-difference (ΔCFI) index. Accordingly, non-invariance is concluded if the chi-square difference value is not statistically significant and the CFI value is lower than 0.01.

In a third step, to provide additional evidence of convergent validity and in order to understand particular patterns, the associations between specific ERI subscales (effort, reward, ERI ratio, and overcommitment) and mental health indicators (GHQ total scores and sub-dimension scores of depression, somatic symptoms, anxiety/insomnia, depression) were analyzed by country and controlled for socio-demographic variables using partial correlations. This strategy gave the possibility to test differential relationships that ERI ratio had with mental health in comparison with its component scales. SPSS 18 and AMOS 16 statistical packages were used in all these analyses.

The differences in ERI scores by socio-demographic variables have been inconsistent across some studies (see Siegrist et al., 2004; Lau, 2008), which indicates the necessity of exploring this issue in Latin-American health employees. In the final stage, means of effort, reward, effort/reward ratio, and over-commitment were analyzed by socio-demographic variables including age, marital status, and education level.

Results

Psychometric Properties of ERI Scales

Table II summarizes the psychometric properties for the effort, reward, and overcommitment scales by country and in the global sample. With regards to the effort scale, the model fit based on the assumption of one latent factor with six items loading was adequate not only in the global sample but also in each country's sample. Most indices were appropriate (above 0.95); including those related to residual variances (RMR and RMSEA), those related to explaining variance (GFI), and indices related to comparing with the null model (CFI). This means that most of the models explain more that 95% of the observed variance and covariance, and they are independent of the null model confirming their theoretical structure. Internal consistency was adequate in all cases, except for the Argentinean sample, where Cronbach's alpha was 0.56 (also poor fit was found in RMSEA and CFI values for Argentinean sample). In general, the items, ERI 2 ("*I have many interruptions and disturbances in my job*") and ERI 3 ("*I have a lot of responsibility in my job*") had the lowest total/item correlations in most samples; however these correlations were above 0.30 in virtually all cases.

The reward scale was specified including a second order analysis, which includes five items loading on the esteem factor, two items loading on the job insecurity factor, four items loading on the job promotion factor (first order), and the total scores of esteem, job insecurity, and job promotion loading on a more general factor called "reward" (second order). This specification is based on theoretical assumptions and previous studies with the ERI scale [Siegrist et al., 2004; Weyers et al., 2006]. The adjustment fit indices for the reward scale were adequate for the global sample and in most of the samples, except for Argentina and Peru where all indices were unacceptable. Cronbach's alpha values were between 0.81 and 0.89 for all countries except for Argentina, where a Cronbach's alpha value of 0.53 was found. The items with the lowest item/total correlations and low loadings were different across samples, but the most common were items ERI 15 ("*Considering all my efforts and achievements, I receive the respect and prestige I deserve at work.*"), ERI 14 ("*my current occupational position adequately reflects my education and training*"), ERI 13 ("*my employment security is poor)* and ERI 11 ("*My job promotion prospects are poor*"), however most of loadings were above .50. In most cases, moderate or high correlations among the three factors esteem, promotion, job security, and reward latent factor were observed.

As for the overcommitment scale, specification is similar to the effort scale in which one latent factor is assumed with six variables loading on this factor. Fit indices were adequate and the model explains more than 97% percent of observed variances and covariances in the global sample and with similar values in the subsamples. Comparative indices showed that the model is independent of the null model with appropriate indices. Moreover, Cronbach's alpha was also adequate with ranges from 0.64 to 0.95. The item/total correlation analyses and loadings showed the item three (OV3) ("*When I get home, I can easily relax and switch off work*") had the lowest association with the total scale in both the global sample and in each subsample.

Multigroup Factorial Invariance of ERI Scales Across Samples

Table III shows that for the effort and overcommitment scales the models with no constraints fit well to the data (most indices were appropriate) supporting structural invariance across the six national groups. Likewise, the models where factor loadings were set to be the same across groups (constrained) also fit well to the data, while the X^2 and ΔCFI tests showed that the additional constraints that were imposed on these models did not alter model fits, thus showing metric invariance (equivalent loadings) among groups in both scales (effort and overcommitment).

As for the reward scale, the multigroup analyses did not support structural ($X^2/df = 6.37$, CFI $= 0.82$, CFI $= 0.77$, RMR $= 0.14$) or metric invariance ($X^2/df = 6.07$, GFI $= 0.79$, CFI $= 0.74$, RMR $= 0.27$), since the models without equal factor loading constraints did not fit well to the data, and the models with equal factor loading constraints resulted in an additional significant drop in fit (ΔCFI $= 0.03$, $\Delta X^2 = 261.726$, $P = 0.000$). Thus the reward scale and items

TABLE II. Psychometric Properties of ERI Questionnaire in Latin-American Samples

		Effort 1st Order CFA					**Reward 2nd Order CFA[c]**					**Over-commitment 1st Order CFA**				
Sample	ERI Item order	ERI 1 = Time pressure ERI 2 = Interruptions ERI 3 = Responsibility ERI 4 = Work overtime ERI 5 = Physically demanding ERI 6 = More demanding					Esteem (E): ERI 7 = Respect superiors, ERI 8 = Respect colleagues, ERI 9 = Support, ERI 10 = Treated unfairly, ERI 15 = effort x respect.		Promotion (P): ERI 14 = Position, ERI 16 = effort x prospects, 17 = effort x income, ERI 11 = promotion prospects		Security (S): ERI 12 = Undesirable Change, ERI 13 = Job security	Ov 1 = Time pressure, Ov 2 = Think about problems, Ov3 = Easily relax[*], Ov 4 = Sacrifice much, Ov5 = Work on my mind, Ov6 = sleeping problems.				
Global Sample N = 1292	Loadings	0.74, 0.58, 0.59, 0.59, 0.62, 0.71					E = (0.94); 0.67, 0.70, 0.70, 0.63, 0.61, P = (0.68); 0.68, 0.79, 0.64, 0.62 S = (0.71); 0.83, 0.63					0.43, 0.66, 0.30, 0.54, 0.77, 0.59				
	Cronbach Alpha	0.80					0.86					0.73				
	Fit indices	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA
		8.24	0.98	0.04	0.96	0.07	9.97	0.94	0.07	0.93	0.08	5.93	0.98	0.01	0.97	0.06
Argentina N = 104	Loadings	0.82, −0.09[**], 0.37, 0.54, 0.37, 0.52					E = (0.20); 0.17, 0.11, 0.34, 0.01, 0.06[**] P = (0.48); 0.09, 0.01, 0.03, 0.39 S = (0.38); 0.05, 0.26					0.38, 0.66, 0.26, 0.38, 0.76, 0.62				
	Cronbach Alpha	.56					.53					.64				
	Fit indices	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA
		2.93	0.92	0.09	0.78	0.13	3.63	0.79	0.16	0.33	0.16	2.09	0.95	0.03	0.91	0.10
Chile N = 67	Loadings	0.66, 0.53, 0.73, 0.46, 0.84, 0.87					E = (0.73); 0.66, 0.57, 0.65, 0.67, 0.74 P = (0.47); 0.52, 0.72, 0.59, 0.68 S = (0.25); 0.72, 0.41					0.59, 0.88, 0.27, 0.39, 0.63, 0.63				
	Cronbach Alpha	.84					.81					.74				
	Fit indices	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA
		1.34	0.93	0.05	0.98	0.07	1.44	0.87	0.08	0.90	0.08	1.18	0.95	0.04	0.98	0.05
Colombia N = 294	Loadings	0.71, 0.63, 0.51, 0.59, 0.57, 0.76					E = (0.91); 0.68, 0.73, 0.65, 0.51, 0.63 P = (0.88); 0.63, 0.62, 0.54, 0.45 S = (0.65); 0.82, 0.78					0.51, 0.61, 41, 0.56, 0.80, 0.61				
	Cronbach Alpha	.79					.85					.77				
	Fit indices	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA
		2.49	0.97	0.05	0.97	0.07	3.33	0.92	0.08	0.91	0.08	2.78	0.98	0.02	0.97	0.06
México N = 322	Loadings	0.78, 0.80, 0.29, 0.70, 0.62, 0.49					E = (0.88); 0.55, 0.60, 0.66, 0.73, 0.78 P = (0.78); 0.74, 0.78, 0.65, 0.54 S = (0.78); 0.85, 0.70					0.34, 0.67,12, 0.61, 0.84, 0.62				
	Cronbach Alpha	0.76					0.89					0.69				

(*Continued*)

TABLE II. (*Continued.*)

		Effort 1st Order CFA					Reward 2nd Order CFA^c^					Over-commitment 1st Order CFA				
	Fit indices	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA
		2.21	0.98	0.04	0.98	0.06	4.44	0.91	0.07	0.93	0.10	2.78	0.97	0.01	0.96	0.07
Perú	Loadings	0.87, 0.71, 0.75, 0.79, 0.75, 0.76					E = (0.23); 0.76, 0.86, 0.76, 70, 0.47					0.46, 0.42, 0.35, 0.82, 0.74, 0.36				
N = 175							*P* = (0.57); 0.88, 0.84, 0.55, 0.76									
							S = (0.77); 0.92, 0.65									
	Cronbach Alpha	0.89					0.89					0.73				
	Fit indices	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA
		4.17	0.95	0.03	.90	0.13	11.73	0.65	0.16	0.71	0.24	2.09	0.96	0.04	0.96	0.07
Venezuela	Loadings	0.60, 0.47, 54, 0.48, 0.54, 0.71					E = (0.79); 0.70, 0.60, 0.63, 65, 0.65					0.34, 70, 0.22, 0.57, 0.78, 0.56				
N = 330							*P* = (0.72); 0.55, 0.84, 65, 0.71									
							S = (0.81); 0.61, 0.46									
	Cronbach Alpha	.72					.84					0.68				
	Fit indices	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA	X^2/df	GFI	RMR	CFI	RMSEA
		2.47	0.98	0.04	0.96	0.06	3.58	0.93	0.08	0.91	0.08	4.38	0.97	0.04	0.93	0.10

Notes: [*]Item 3 of overcommitment scale was recoded. [**]No significant loadings are underlined. [c]covariance between measurement error of ERI 15 and job promotion subscale was accepted in order to improve model fit in all samples.

were not equivalent across the six groups. As an additional explorative step, we decided to test invariance properties excluding Perú and Argentina samples in multigroup analyses due to their misfit in the confirmatory factor analyses in each sample. In this case fit indices indicated a marginal structural invariance (X^2/df = 3.68, GFI = 0.91, CFI = 0.90, RMR = 0.08) across the four national data sets from Chile, Colombia, Mexico, and Venezuela, but for factor loading invariance across the four national data sets the indices improved slightly, however they did not reach satisfactory values (ΔCFI = 0.01, $\Delta X^2 = 92.92$, $P = 0.000$).

An important result is that the covariation between errors of item ERI 15 (an item of the "esteem" subscale of the ERIQ reward scale) and promotion subscale was allowed whether for single and multigroup confirmatory factor analyses in order to improve fit indices (see Tables II and III), suggesting a possible relationship between this item and the sub-scale of the ERIQ promotion scale, in all of the six samples.

ERI Scales Associated With Mental Health

Although most correlations between the specific and total scores of GHQ (mental status) and each of the ERI dimensions were significant in each country's sample in the non-adjusted model (not shown) and the adjusted model after controlling for age, education level, and marital status (Table IV), there were some noticeable differences in the pattern of the correlations across countries. For example Chile had the fewest and weakest correlations between all ERI scales and mental health indicators (from 0.05 to 0.33), while Mexico had the largest and the strongest ones (from 0.12 to 0.64). Reward seems to be more important than others ERI's sub-scales (in terms of correlations with mental health indicators) in Peru and Colombia, and less in Argentina. Among all ERI scales, overcommitment scale had the weakest correlations with mental health indicators in four countries (Colombia, Mexico, Peru y Venezuela). Only in two out of the six countries (Mexico and Argentina), ERI ratio had higher correlations with all or most of mental health indicators than its component scales (effort, overcommitment or reward scales).

Demographics and ERI Scales

A series of analyses were conducted to identify possible ERI differences between demographic characteristics. Although differences were found in gender and type of caregiver profession (not shown), we focus in lesser heterogeneous variables in the samples such as age, marital status, and education level. A consistent finding across countries was that the higher the educational level the lower

TABLE III. Multigroup Analyses of Factorial Invariance of ERI Scales Across Latin-American Samples

	X^2	DF	p	X^2/DF	GFI	CFI	RMSEA	RMR	ΔDF	ΔX^2	sig	ΔCFI
First-order factor of effort												
Configural Model, factor loadings unconstrained	252.66	54	0.000	4.67	0.93	0.91	0.053	0.072	–	–	–	–
Metric model, factor loadings constrained	274.40	72	0.000	3.81	0.94	0.91	0.047	0.232	18	21.738	0.244	0.00
Second-order factor of reward (esteem, career opportunities, job security)												
Configural Model, factor loadings unconstrained	1567.40	246	0.000	6.37	0.82	0.77	0.06	0.14	–	–	–	–
Metric model, factor loadings constrained	1829.13	301	0.000	6.07	0.79	0.74	0.06	0.27	55	261.726	0.000	0.03
Second-order factor of reward without Peruvian and Argentine Samples*												
Configural Model, factor loadings unconstrained	545.111	148	0.000	3.68	0.91	0.90	0.05	0.08				
Metric model, factor loadings constrained	638.035	178	0.000	3.58	0.89	0.89	0.05	0.14	30	92.92	0.000	0.01
First-order factor of overcommitment[6]												
Configural Model, factor loadings unconstrained	263.18	54	0.000	4.87	0.94	0.87	0.05	0.04	–	–	–	–
Metric model, factor loadings constrained	273.79	84	0.000	3.25	0.93	0.88	0.04	0.08	30	10.604	0.100	0.00

Note: *covariance between measurement errors ERI 15 and job promotion, ERI14 and esteem (reward scale) were accepted in these analyses.

the reward and the greater the imbalance in the global sample with a similar pattern in the three sub-samples (Table V).

DISCUSSION

The study of ERI validity in the health professionals sector would seem to be an important contribution, since imbalance between effort and reward is frequently observed in health professionals according to studies in different countries [Bakker et al., 2000; Hasselhorn et al., 2004; Tsutsumi and Kawakami, 2004; van Vegchel et al., 2005]. In Latin-America some studies have documented that professional in these regions face precarious working conditions. Work intensification has also been identified due to the gap between the population's health needs and the available human resources to face them [Schweiger and Álvarez, 2007; PAHO, 2012].

Despite a large body of evidence confirming the importance of the ERI model and the ERIQ in work stress research in developed countries, research on the ERI model and the ERIQ has been insufficient in Latin-American countries. This may be explained by two main reasons: (i) the lack of research in occupational health psychology itself in this region and (ii) the common interest of Latin-American researchers to develop and use local models that consider inner cultural-context specificities in the work stress process within each region. Although this second reason is important, an unavoidable and complementary step in the understanding of work stress mechanisms is to test universal or generalizable models, most importantly when they incorporate variables of the current global work market and when the evidence is more and more consistent and convincing as it has been with the ERI model. This was the intended contribution of this study.

While few studies on the ERIQ in health care workers have been carried out in the American continent, the current study not only tested the specific psychometric properties of the ERIQ scales and items in its Spanish version but also examined the invariance of factor structure and factor loadings of the ERIQ items from health professionals across six Latin-American countries. In addition, the current study tested convergent validity of the ERIQ scales through the association with mental health in these Latin American countries.

The factor structure and psychometric properties of the ERIQ detailed findings in each scale are discussed below:

In the effort scale, the results of CFAs and internal consistency showed satisfactory properties, in each country's sample, in the global sample, and in the separate analyses (Table II). It is important to note that items, ERI 2 (*"I have many interruptions and disturbances…"*) and ERI 3("*I have a lot of responsibility in my job*") consistently had the lowest psychometric performance across countries. Similar results

TABLE IV. Partial (Adjusted) Correlations Between Each ERI Scale and Mental Health Variables

	CONTROLLING FOR AGE, MARITAL STATUS AND EDUCATION LEVEL[a]				
SAMPLE	**Total GHQ**	**Somatic Symptoms**	**Anx/insomnia**	**Soc. Dysfunction**	**Depression**
Argentina					
Effort	0.37**	0.36**	0.31**	0.25*	0.25*
Reward	−0.13	−0.03	−0.17	−0.11	−0.12
ERI	0.39**	0.34**	0.35**	0.29**	0.27**
Overcomm	0.34**	0.41**	0.31**	0.20*	0.06
Chile					
Effort	0.26	0.33*	0.24	0.05	0.28*
Reward	−0.24	−0.27	−0.17	−0.20	−0.14
ERI	0.28*	0.32*	0.26	0.14	0.21
Overcomm	0.27	0.26	0.27	0.20	0.14
Colombia					
Effort	0.12	0.13*	0.10	0.09	0.00
Reward	−0.16**	−0.17**	−0.20**	0.03	−0.11
ERI	0.15*	0.16**	0.16**	0.03	0.04
Overcomm	0.04	−0.01	0.04	0.09	0.05
México					
Effort	0.57**	0.50**	0.50**	0.37**	0.43**
Reward	−0.54**	−0.47**	−0.45**	−0.35**	−0.45**
ERI	0.64**	0.55**	0.53**	0.43**	0.55**
Overcomm	0.16**	0.14**	0.12*	0.14*	0.10
Perú					
Effort	0.18*	−0.01	0.13	0.12	0.28**
Reward	−0.48**	−0.35**	−0.31**	−0.28**	−0.36**
ERI	0.34**	0.14	0.28**	0.18*	0.37**
Overcomm	0.03	0.05	0.04	−0.05	0.11
Venezuela					
Effort	0.13*	0.11*	0.12*	0.13*	0.00
Reward	−0.17**	−0.10	−0.10	−0.22**	−0.09
ERI	0.15*	0.09	0.13*	0.17**	0.03
Overcomm	0.08	0.04	0.06	0.13*	−0.00

*$P < 0.05$.
**$P < 0.01$.
[a]Dummy variables: age <41, without partner and high school or less as a reference groups respectively.

have been reported in previous studies (Rödel et al., 2004; Rantanen et al., 2012). Most of the correlations with these items in this study were acceptable (>0.30). Unlike previous cross-cultural comparability analyses of the ERIQ [Tsutsumi et al., 2009], items ERI 4 ("*I am often pressured to work overtime*") and the effort scale were not problematic in this study. The results of multigroup CFAs supported structural and metric invariance, which suggests the underlying effort construct is well represented by the selected items in the six Latin-American samples and reveals that the health professionals from the six countries interpret and respond to the items in a similar way (cross-cultural validity).

As for the reward scale, psychometric properties and theoretical structure were acceptable for most samples with Argentina and Peru as an exception since they had unacceptable fit indices (Table II). Samples from Chile, Colombia, Mexico, Venezuela and the global sample showed Cronbach values above 0.81, most loadings were above 0.50, and fit indices were appropriate in separate analyses. In the multigroup inavariance analyses, the reward scale was not equivalent in terms of structure (structural invariance) and factor loadings (metric invariance) across the six countries. When the Argentinean and Peruvian samples were excluded in the multigroup analysis, structural invariance reached marginal values, which means that the theoretical construct was partially invariant in the other four countries (Chile, Colombia, Mexico, and Venezuela). However, metric invariance was not confirmed even across these four

TABLE V. Means of ERI Variables by Socio-Demographical Variables

Country sample	%	Effort	*P*	Reward	*P*	Over-commitment	*P*	ERI Ratio	*P*
Global Sample N = 1292									
Age					0.66				
Up to−40	57.6	14.14	0.28	42.92		13.34	0.66	0.67	0.90
More than 41	42.4	13.81		42.68		13.42		0.67	
Marital Status	45.4	13.88	0.11	42.44	0.94	13.14	0.34	0.66	0.80
No partner									
With Partner	54.6	13.37		42.48		12.95		0.67	
Education Level									
Up to High School/technical	61.5	13.95	0.86	43.34	0.01	13.18	0.70	0.64	0.01
College/Graduate	38.5	14.00		41.81		13.18		0.72	
Argentina N = 104									
Age									
Up to−40	52.9	11.40	.38	46.05	0.38	13.66	0.24	0.46	0.57
More than 41	47.1	10.76		45.25		14.28		0.44	
Marital Status									
No partner	45.2	10.58	0.19	45.95	.62	14.12	0.55	0.42	0.15
With Partner	54.8	11.51		45.50		13.81		0.47	
Education Level									
Up to High School/technical	39.4	11.24	0.53	44.56	.06	13.87	0.90	0.47	0.25
College/Graduate	60.6	10.78		46.40		13.94		0.43	
Chile N = 67									
Age									
Up to−40	23.9	14.43	0.23	42.37	0.28	15.25	0.11	0.67	0.23
More than 41	76.1	12.80		44.68		13.61		0.56	
Marital Status									
No partner	35.4	13.78	0.53	45.52	0.22	13.65	0.62	0.57	0.61
With Partner	64.6	13.09		43.12		14.12		0.61	
Education Level									
Up to High School/technical	100	13.19		44.10		14.00		0.59	
College/Graduate	n/a								
Colombia N = 294									
Age									
Up to−40	62.4	15.17	0.52	45.01	0.26	14.39	0.74	0.67	0.57
More than 41	37.6	15.61		43.58		14.53		0.72	
Marital Status									
No partner	n/a	n/a		n/a		n/a		n/a	
With Partner	n/a	n/a		n/a		n/a		n/a	
Education Level									
Up to High School/technical	62.0	14.95	0.10	45.65	0.02	14.59	0.60	0.61	0.01
College/Graduate	38.0	16.13		42.61		14.37		0.83	
México N = 322									
Age									
Up to−40	54.5	13.56	0.67	43.90	0.82	12.98	0.86	0.67	0.75
More than 41	45.5	13.87		44.19		12.94		0.69	
Marital Status									
No partner	37.3	13.54	0.81	44.49	0.75	12.90	0.82	0.65	0.65
With Partner	62.7	13.71		44.07		12.95		0.68	
Education Level									
Up to High School/technical	59.3	13.51	0.88	44.10	0.74	12.95	0.83	0.69	0.84

(*Continued*)

TABLE V. (*Continued.*)

Country sample	%	Effort	*P*	Reward	*P*	Over-commitment	*P*	ERI Ratio	*P*
College/Graduate	40.7	13.40		43.61		13.00		0.68	
Perú N = 175									
Age									
Up to−40	44.0	13.02	0.49	40.73	0.68	13.36	0.97	0.70	0.60
More than 41	56.0	12.46		41.38		13.37		0.66	
Marital Status									
No partner	32.6	12.98	0.57	42.14	0.27	14.27	0.01	0.59	0.052
With Partner	67.4	12.57		40.57		12.93		0.72	
Education Level									
Up to High School/technical	33.7	11.22	0.00	42.82	0.10	13.73	0.32	0.57	0.00
College/Graduate	66.3	13.43		40.31		13.18		0.75	
Venezuela N = 330									
Age									
Up to−40	72.6	14.70	0.17	41.00	0.07	12.58	0.50	0.70	0.03
More than 41	27.4	15.44		39.00		12.29		0.80	
Marital Status									
No partner	62.2	15.00	0.37	40.48	0.86	12.68	0.20	0.74	0.28
With Partner	37.8	14.57		40.65		12.18		0.70	
Education Level									
Up to High School/technical	76.3	14.70	0.33	41.36	0.00	12.42	0.53	0.70	0.01
College/Graduate	23.7	15.23		37.84		12.71		0.81	

countries. This may suggest different understanding of the ERI reward items by the health professionals in each country.

Although the data did not support a full equivalence of the reward construct across Latin-American samples, it should be noted that there is some consistency in the results in single CFA and multigroup invariance analyses. For example, most indices were adequate in both analyses, and the Argentinean and Peruvian samples had problematic fit indices in both the single and invariance analyses. Thus, the reward scale did not work properly mainly in those two samples, suggesting differences in translation or in the interpretation of the items due to cultural differences (e.g., the meaning of reward). This study is insufficient to explain the lack of equivalence of factor loadings or item differential functioning (DIF) across the six samples, and whether this incongruity is a translation issue or a cultural one (e.g., we could not compare the accuracy of translation quality between countries by independent researchers). Our findings could be affected by both since previous studies have found that Spanish (from Spain) wording in psychological scales translations are not fully equivalent in Latin American contexts [Oliva and Calleja, 2010], and also wellbeing and quality of life related constructs in developed countries are not always culturally equivalent in Latin American countries [Aznar and Castañón, 2012]. Moreover, a recent DIF analysis of a large European dataset of the Job Content Questionnaire (JCQ), found that 50% of DIF items were related to translation problems, while the other 50% of DIF items appeared to be related to unexplained cultural issues [Choi et al., 2009]. In the future, more sophisticated studies using a mixed methods approach for finding the causes of DIF items in the ERIQ reward scale needs to be conducted.

Covariation between errors in ERI 15 item and the promotion subscale in order to improve fit indices in all models and samples (see Tables II and III) may be explained by a possible strong relationship between this item and the sub-scale of the ERIQ promotion scale. From a theoretical point of view, we can see that item ERI 15 ("*Considering all my efforts and achievements, I receive the respect and prestige I deserve at work.*") assesses an effort-reward imbalance situation by itself, as do items, ERI 16 ("*Considering all my efforts and achievements, my job promotion prospects are adequate*") and ERI 17 ("*Considering all my efforts and achievements, my salary is adequate*") of the promotion subscale. Note that the wording of those three reward items, "considering all my efforts…," are reflecting effort, thus those three items may conceptually assess an imbalance between effort and reward rather than reward [Choi et al., 2014]. In addition, item ERI 15 was among the lowest in factor loadings and correlation item/total scale in most Latin American samples in the current study, particularly in Argentina and Peru. Previous studies in Greece have also shown that item 15 had the lowest internal consistency [Msaouel et al., 2012].

Overcommitment was the only scale that worked well in all samples, in single and multigroup analyses. All fit indices were adequate and internal consistency ranged from 0.64 to 0.77. The construct of overcommitment remained invariant across the six samples. However, item OV 3 was problematic both in the global sample and in each sub-sample ("*When I get home, I can easily relax and switch off work*"). This lowest psychometric performance was similar in different ERIQ versions, such as the Greek (Rödel et al., 2004; Msaouel et al., 2012), Thai [Buapetch et al., 2008] and Italian [Magnavita et al., 2012]. A possible explanation is that this is the only item that needs to be reversely coded before a total score of the overcommitment scale can be obtained, assuming that relaxing at home is exactly the opposite of being overcommitted to work. This could be inaccurate since previous research has shown that assuming bi-polarity of constructs by pursuing to measure the contrary and then recoding items is not equivalent to measuring the constructs originally intended [Hernández et al., 1997; Bresó et al., 2007]. Moreover, this item could be problematic for female workers who are generally in charge of housework and other caregiving activities at home that may hamper the ability to "switch off work".

Overall, the constructs of effort and overcommitment of the theoretical ERI model have been replicated in the global sample and have also been replicated in most of the six independent samples in Latin-America whether in separate or multigroup analyses. Reserved generalization could be done for the reward scale which was only partially invariant across the six samples.

On the other hand, as complementary validity evidence, the correlations between the ERIQ subscales (reward, effort, and overcommitment) and the four GHQ mental health indicators (depression, somatics, social dysfunction, and anxiety/insomnia) were tested after controlling for associated socio-demographic variables, such as age, education level, and marital status. Although most of correlations were significant in general, the findings were not similar across countries. It is important to note that specific correlations between reward and GHQ indicators were very weak, mainly in Argentina and Chile. A remarkable finding was also that the correlations of overcommitment scale with mental health indicators were very weak in four out of the six countries, thus calling into question the convergent validity of these scales in the countries.

The results of the current study did not support the originally suggested theory that that the combination of effort and rewards has a greater risk for stress compared to any of its isolated components of the scale (effort or reward) [Siegrist, 1996; Weyers et al., 2006], since ERI ratio had the highest correlations with mental health indicators in only two of six countries.

Regarding the ERIQ and demographic variables, although there is not a clear pattern of the relationship between education level and ERI variables in previous research, in this study a relatively consistent pattern was found across countries. Those with a low educational level had more reward and less effort-reward imbalance than those with a high education level. This contrasts with some previous studies [Tsutsumi and Kawakami, 2004; Siegrist et al., 2004]. Some studies in Latin-America have shown that the poorest and least educated are more content with their social life circumstances than wealthier or better educated people [Lora, 2009]. However, these results should be taken cautiously due to the aforementioned limitations on the reward scale, but also due to the heterogeneous sample sizes used in these comparisons.

Some limitations of this study need to be addressed. Firstly, sample sizes within each country were small and obtained in a non-randomized way with heterogeneous characteristics, causing potential bias in sociodemographic comparisons and factor analyses results. A more representative and balanced sample among professions, gender, and other characteristics could have helped in explaining some of the unexpected results. Secondly, convergent validity testing was based on two self-reported measures having a limitation regarding the common method variance [Podsakoff et al., 2003]. Finally, we cannot assure a full absence of cross-cultural equivalence of the reward scale in this study, particularly due to the fact that the sample characteristics were not paired.

Despite these limitations and in light of global findings, overall results indicate that most of the ERIQ scales appear to have satisfactory psychometric properties in most countries, and could be useful for studying work-related stress in populations of Latin-American health professionals. However more and future studies are suggested to analyze the problems in the scales, such as the low correlations of overcommitment with mental health, the dissimilar pattern of correlations with mental health indicators between countries, and, primarily, the reward factor construct. This construct could be understood differently across cultures and might need to be cautiously adapted in different sectors, occupations, and regions within Latin-American countries.

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