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ESTANDARIZACIÓN DE UNA BATERÍA PARA LA EVALUACIÓN DE FACTORES DE RIESGO PSICOSOCIALES LABORALES EN TRABAJADORES COLOMBIANOS

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Resumen

En 2010 se desarrolló una batería de instrumentos para evaluar factores psicosociales laborales de riesgo para la salud, en respuesta a la Resolución 2646 de 2008 del Ministerio de la Protección Social de Colombia. Sin embargo, esta cuenta con algunas limitaciones que, a partir de la construcción y validación de una nueva batería, en el presente estudio se buscan superar. La nueva batería ofrece, recursos adicionales para la evaluación de estos factores: incorpora los instrumentos e indicadores centrales de los modelos demanda-control-apoyo social y desequilibrio esfuerzo-recompensa, y los factores intralaborales no contemplados en dichos modelos, pero que la Resolución considera necesarios, se midieron con pruebas preexistentes o desarrolladas por los autores. Con los datos recolectados es posible calcular indicadores globales de demanda, control y apoyo social; además de condiciones familiares y sociales de riesgo, afrontamiento, personalidad e indicadores de salud y bienestar. Para la validación, la batería se aplicó a una muestra de 16.095 trabajadores de diferentes ocupaciones y municipios colombianos. Los análisis de consistencia interna y validez permiten afirmar que la batería es sencilla de aplicar en papel o por computador, permitirá comparar ocupaciones, obtener puntuaciones unificadas por variable, ofrecer un diagnóstico de un número importante de las variables sugeridas en la Resolución y comparar los resultados de los trabajadores colombianos con los de otros países.
Palabras clave: factores laborales de riesgo psicosocial, Resolución 2646 de 2008, modelo demanda-control-apoyo social, modelo desequilibrio esfuerzo-recompensa, estrés laboral, evaluación.

STANDARDIZATION OF A BATTERY OF TESTS TO ASSESS PSYCHOSOCIAL RISK FACTORS AT THE WORKPLACE AMONG COLOMBIAN WORKERS

Abstract

A battery of questionnaires to assess psychosocial risk factors at work was developed in 2010 in response to Resolution 2646 created by the Colombian Ministry of Social Protection. However, this battery presents some theoretical and practical limitations. A new battery of instruments has been designed and validated that includes instruments and risk indicators of the demand-control-social support and the effort-reward imbalance models. Other factors, not included in these models, but that Resolution 2646 suggests should be assessed, have also been added, and with this additional information, the new battery allows us to also calculate a "global indicator" of demand, control, and social support; family and social risk conditions, coping and personality; and health and wellbeing. The new battery was administered to a sample of 16,095 workers from different occupations and representative Colombian regions. An analysis of the various domains indicates that internal consistency of the various scales is high. The new battery has the following properties: it is simple to use in paper format or when administered by computer, it enables comparison between occupations, it offers unified scores for each variable, and provides information to assess the risk factors suggested by resolution 2646. In addition, it will make it possible to compare the results obtained when analyzing Colombian workers with those obtained from studies of workers from other countries.
Key words: psychosocial risk factors, work, Resolution 2646 of 2008, demand-control-social support model, effort-reward imbalance model, job stress, survey.

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PADRONIZAÇÃO DE UMA BATERIA PARA A AVALIAÇÃO DE FATORES DE RISCO PSICOSSOCIAIS TRABALHISTAS EM TRABALHADORES COLOMBIANOS

Resumo

Em 2010, desenvolveu-se uma bateria de instrumentos para avaliar fatores psicossociais trabalhistas de risco para a saúde, em resposta à Resolução 2 646 do Ministério da Proteção Social da Colômbia. Contudo, esta conta com algumas limitações que, a partir da construção e da validação de uma nova bateria, neste estudo se pretendem superar. Além disso, a nova bateria oferece recursos adicionais para a avaliação desses fatores: a presente bateria incorpora os instrumentos e os indicadores centrais dos modelos demanda-controle-apoio social e desiquilíbrio esforço-recompensa e os fatores internos do trabalho não considerados nesses modelos, mas que a Resolução considera necessários, mediram-se com testes preexistentes ou desenvolvidos pelos autores. Com os dados coletados, é possível calcular indicadores globais de demanda, controle e apoio social; além de condições familiares e sociais de risco, enfrentamento, personalidade e indicadores de saúde e bem-estar. Para a validação, a bateria foi aplicada a uma amostra de 16 095 trabalhadores de diferentes cargos e municípios colombianos. As análises de consistência interna e validade permitem afirmar que a bateria é simples de aplicar em papel ou digital, permitirá comparar cargos, obter pontuações unificadas por variável, oferecer um diagnóstico de um número importante das variáveis sugeridas na Resolução bem como permitirá comparar os resultados dos trabalhadores colombianos com os de outros países.
Palavras-chave: fatores trabalhistas de risco psicossocial, Resolução 2 646 de 2008, modelo demanda-controle-apoio social, modelo desiquilíbrio esforço-recompensa, estresse profissional, avaliação.

In 2008, the Colombian Ministry of Social Protection published Resolution 2646, through which it regulated the responsibilities of Colombian employers regarding the prevention, diagnosis, intervention, and control of Psychosocial Risk Factors in the Workplace (Ministry of Social Protection, 2008). The resolution emphasizes the importance of using instruments that have been validated in Colombia to measure these variables; as such, in 2010, the Ministry of Social Protection commissioned Universidad Javeriana to design a battery of instruments that would assess psychosocial risk factors (Ministry of Social Protection, 2010).

The Ministry's battery offers the following benefits: a) it contains a number of questionnaires in use in the public domain, b) it includes a large part of the variables and information that the Ministry expects will be taken into account, and c) it offers other resources for the assessment of psychosocial risks at the workplace. The questionnaire is the most widely used assessment resource in the battery; however, it does contain a number of practical and theoretical limitations. The practical limitations include: a) a restriction to being computer applied (Ministry of Social Protection, 2011); b) the impossibility to compare occupations, given that the battery only assesses certain types of positions (bosses, professionals, technicians, auxiliaries-workers); c) the complexity in terms of the planning and application of tests;[1] e) the impossibility of obtaining a consolidated score per variable;[2] f) an incomplete diagnosis given that the battery does not cover all the variables pinpointed in the resolution; and finally, g) for the purposes of research and epidemiological studies, the fact that the battery uses completely new questionnaires introduces an additional limiting factor which makes it impossible to compare the results obtained for previously assessed Colombian groups with the results for workers in other parts of the world.

The theoretical limitations of the battery, on the other hand, include the fact that to design the battery, its authors based themselves on a) the effort-reward imbalance model, b) the demand-control-social support model, c) the factorial structure of the Copenhagen Psychosocial Questionnaire, d) the Ivancevich and Matteson theory on stress, and e) the country's needs and the authors' previous research and experience (Villalobos, Vargas, Rondón, & Felknor, 2013). However, while some of the components of the theoretical contributions of the demand-control-social support (DCS) and effort-reward imbalance (ERI) models, were used (psychological demands, job control, rewards, and social support), others that are an integral part of the models were omitted (effort, over-commitment, job strain, and effort-reward imbalance). The latter two represent, according to the models, the psychosocial work factors that present the greatest health risks: the

[1] The battery has two formats, according to the worker's type of position. This entails the investment of considerable time and effort before initiating assessment in order to classify workers to determine the appropriate format to be applied to each individual. If the wrong test is applied to a worker, it will have to be nullified and the worker assessed again.

[2] The two formats have different scales, which means that all variables have to be calculated twice, once for the types of positions assessed for format A, and once for the positions calculated with format B. Thus each corporate diagnosis becomes a process which is a) very lengthy, b) difficult to understand for organizations, c) restrictive of the possibilities for consolidated analysis, and d) that reinforces the idea in companies that the intervention is carried out on workers and not on the causes of risk factors.

interaction between demand and control, on the one hand, and effort and reward, on the other. The Ministry's battery only allows the assessment of the independent impact of demand and control (and not their relationship) and does not permit the calculation of the imbalance between effort and reward. Finally, the questionnaires built to measure these concepts are different from those proposed by the original authors, making it more complicated to compare the data obtained for the groups assessed using this battery with groups assessed in other countries.

In other words, given that the battery did not include all the work-related factors or the models' relational indicators, from which its main theoretical predictions are derived, it would seem that the use of these models was incomplete. The relevance of this theoretical incoherence consists of the fact that it has been empirically demonstrated that not all the intralabor variables (or the extralabor or personal ones) are equally relevant in terms of the health risks presented. The models by Karasek (1979) and Siegrist (2002) maintain that some psychosocial work factors are more relevant than others (labor demand, job control, efforts invested, rewards that compensate for the efforts invested in work), and that health risks can be predicted much more precisely when we consider the interaction between these factors and not just the information derived from each of them independently. As the intralabor factors are described and measured by the Ministry's battery, it would seem that they all have the same capacity to affect workers' health, and this is not coherent with the predictions made by the Karasek and Siegrist models or with the innumerable empirical data that supports them (see below).

The aim of this study was to build and validate a battery that can overcome some of the limitations that have been found in the Ministry of Social Protection's Psychosocial Risk Factors battery. Concretely, we expect the new battery to: a) facilitate the assessment of workers by computer and on paper; b) reduce and simplify the logistic efforts related to the test; c) assess a greater number of variables suggested by Resolution 2646, and at the same time offer the possibility to calculate the indicators that, according to the literature, represent greater health risks for workers; d) make it possible to compare the data for Colombian workers with data from previous studies (national or international); and e) facilitate decision-making in relation to sustained theoretical and empirical prevention and intervention. It is also worth mentioning that having more than one validated instrument in Colombia provides greater options for measurement that can deal with the needs of a great diversity of companies, economic activities, and the existing realities and interests in terms of assessment.

In its Resolution 2646 of 2008, the Colombian Ministry of Social Protection defined psychosocial factors as "intralabor and extralabor aspects, or those that are external to the organization and the individual conditions or intrinsic characteristics of the worker, which, dynamically interrelated, through perceptions and experiences, influence people's health and performance" (Ministry of Social Protection, 2008, p. 3). This definition guided the determination of the variables and conditions that should be assessed according to Resolution 2646.

The battery presented in this paper is based on the definition provided by ILO/WHO (ILO-WHO joint committee, 1984), which partially coincides with the Ministry, but emphasizes psychosocial work factors. It affirms that "Psychosocial factors in the workplace consist of the interaction between work, the environment, job satisfaction and the conditions of the organization, on the one hand, and the interactions between the worker's skills, needs, culture and personal situation outside of work, on the other, all of which, through perceptions and experiences, may influence health, performance, and satisfaction at work" (s.p.).

The ILO/WHO definition of psychosocial factors at work implies that the effects of such factors can be both positive and negative and they depend on the fit between the skills and characteristics of the employee and the demands of the conditions of the work environment. The definition also emphasizes the perception and experience of these factors and the way in which they can lead to health risks for individuals and organizations. Finally, it points out how the impact of psychosocial work factors is moderated by workers' personal and cultural conditions.

This conceptualization enables theoretically sustained decision-making when it comes to assessing psychosocial risk factors in the work context. In particular, it leads to the consideration of general theories on stress, emphasizing theories on work-related stress to determine how psychosocial conditions at work can turn into risk or protection factors, and it helps to define which of the variables should be considered of greater interest.

The particular relationship between work-related psychosocial factors, stress, and health is maintained in a number of theoretical models, among which we highlight the ones developed by Karasek (demand-control-social support (DCS); Karasek, 1979; Karasek & Theorell, 1990) and by Siegrist (effort-reward imbalance (ERI); Siegrist, 2002).

The DCS model mainly considers what is contained in the paper (Karasek & Theorell, 1990). The most important components of this model are the psychological demands of work and the possibility of, during work, using or learning new skills and making decisions regarding the way in which tasks should be carried out (known as job control or decision latitude). The main hypothesis of the DCS model states that the jobs that generate the most dissatisfaction and disease are those in which people have to deal with

a simultaneous combination of high job demand and low control; a combination which has been labeled Job Strain (Karasek & Theorell, 1990).

The DCS model also includes social support in the workplace, referring to the global levels of social interaction that provide support at work by supervisors and workmates. This social support could behave as a moderator between psychosocial stressors in the workplace and their adverse results on health, affecting the workers' wellbeing (Karasek, Gardell & Lindell, 1987). The worse combination (high job demands, low decision-making freedom, and low support) will foster the most adverse consequences (Johnson, Hall & Theorell, 1989; Kinman, Jones & Kinman, 2006; Winefield, Gillespie, Stough, Dua, Hapuarachchi & Boyd, 2003). Job insecurity, despite not being taken into account among the model's most important predictions, is considered because a number of different studies systematically point out that it is a potent and independent indicator of health problems.

The health impact of stressful work conditions proposed by the DCS model has been studied for many years. A large number of studies undertaken in different countries have shown the effects of jobs that give rise to job strain on blood pressure, coronary heart disease, psychological discomfort, musculoskeletal disorders, among others (Ganster & Schaubroek, 1991; Johnson & Hall, 1988; Johnson, Stewart, Hall, Fredlund, & Theorell, 1996; Karasek, Baker, Marxer, Ahlbom, & Theorell, 1981; Kristensen, 1995, 1996; Schnall, Belkic, Landsbergis, & Baker, 2000; Theorell & Karasek, 1996, Van der Doef & Maes, 1999).

Siegrist's model, known as the *effort-reward imbalance* (ERI) model (Siegrist, 2002) represents the interaction between the person and his environment in the context of social organizations. This theoretical basis focuses on the notion of social reciprocity, a fundamental principle of interpersonal behavior acquired throughout our evolution. Social reciprocity is characterized by mutual efforts of cooperation made on the basis of the expectation that such efforts will be compensated by the equivalent rewards. When this reciprocity fails in some way, it threatens the fundamental principle, fostering strong negative emotions and sustained stress responses. In contrast, when the social response to the effort invested is appropriate, the organisms' emotions and reactions promote health, wellbeing, and survival.

The ERI model affirms that stressful experiences at work, and their ensuing negative effects on health, are an outcome of a recurrent perception of imbalance between a lot of effort invested and/or high external job demands (extrinsic effort) and low rewards; in other words, a lack of cost-benefit reciprocity. According to the model, rewards are distributed among workers through three elements: money, esteem, and control of the job status, meaning control over the possibilities of promotion and job security. The combination of this imbalance with a person's intrinsic effort or over-commitment, increases the tendency towards an elevated autonomic activation and all the associated health problems.

Some examples of studies that have established a relationship between ERI and health indicators are those by Bosma, Peter, Siegrist, and Marmot (1998), who assessed the model in relation to the risk for coronary heart disease; Calnan, Wainwright and Almond (2000) with respect to mental exhaustion; and Tsutsumi, Kayaba, Theorell and Siegrist (2001) who analyzed the relationship of the model with depression in the Japanese.

The DCS and ERI models include a number of characteristics that are extremely relevant in the context of this work: (1) The models are analytical given that they select a number of the multiple intralabor psychosocial factors that could be considered sources of work stress on the basis of theoretical assumptions and empirical results derived from the scientific study of stress. The psychosocial factors chosen affect all occupations (i.e., they are general). (2) Many authors advocate for the joint use of the two models (e.g., Calnan, Wainwrite, & Almond, 2000; Peter, Siegrist, Hallqvist, Reuterwall & Theorell, 2002). Given the different emphasis on control and rewards, the implications for policies for change are different.

To build this battery, considering the advantages of using instruments from models whose theoretical and practical utility has been proven, whose predictive ability has been broadly assessed, and on which there is published data on workers around the world, it was deemed appropriate to incorporate the Job Content Questionnaire (JCQ) and the Effort Reward Imbalance (ERI)-Questionnaire) to assess intralabor psychosocial factors. These instruments—proven to have the adequate psychometric properties in previous studies carried out in Colombia (Gómez, 2010; Gómez, 2011)—will, on the one hand, allow comparisons to be made between workers in Colombia and in other countries, and, on the other, help employers to prioritize a number of factors for intervention, in case a number of them point out a level of risk for the health of their workers.

Given that the DCS and ERI instruments do not cover all the intralabor variables that Resolution 2646 requires to be assessed, the battery under study included other existing instruments that have been previously validated in Colombia or in other countries. A number of additional instruments were also developed and validated when deemed necessary. The Intralabor factors included in the resolution can be conceptually considered examples of demand, forms of control, and social support at work. Based on the data pertaining to this battery, it is possible to calculate the indicators for demand, control, and social support derived from the JCQ; indicators for effort, reward, and over-commitment derived from ERI; the ERI indicator and job strain indicator from

the JCQ; and finally, it is possible to calculate a number of global indicators for demand, control, and social support that combine the information from the JCQ and ERI with that of the other intralabor variables described in Resolution 2646.

There is an extensive bibliography on psychosocial factors at work and their consequences on individuals. However, psychosocial stressors can also originate in sources other than work (e.g. family, social conditions, or certain personal situations). Among the literature on stress, there is an abundant number of studies that look into individual differences that moderate the effects of stress and, in particular, work-related stress (e.g., Lazarus, 1999; Lundberg & Cooper, 2011; Semmer & Meier, 2009). When there is an interest in understanding, preventing and controlling the conditions that may affect workers' health, the above conceptualization highlights that, as well as assessing the most risky intralaboral psychosocial conditions in terms of health, it is also necessary to consider: 1) family or social conditions that may interact with work conditions, 2) personality features that represent risk when they interact with risky work conditions, and 3) coping strategies for stressors, especially those that are work related.

Consistent with this conceptualization and with the instruments designed to assess intralaboral psychosocial factors, the battery includes instruments that allow the evaluation of coping strategies and personality features that may increase or decrease vulnerability to stress and its effects. Finally, tests were included to assess a number of indicators for health and disease conditions such as the perception of health, psychosomatic responses to stress, vitality, and job satisfaction.

METHOD

Design

A cross-sectional survey was carried out using self-reporting instruments.

Participants

Based on the universe of Colombian workers affiliated to the Social Security System (see Table 1), it was calculated that to be adequately represented, the minimum sample required for said universe must include 1,539 workers, distributed by economic sector and region as described in Table 2.

Table 1.
Universe of workers affiliated to the Colombian social security system

Region \ Sector	Services	Commercial	Industry	Agricultural	Total
Andean	2,741,753	723,799	1,524,510	241,218	241,218
Caribbean	532,769	111,416	244,278	29,821	918,284
Pacific	6,818	1,831	2,514	43	11,206
Orinoquia	27,100	4,532	28,896	2,733	63,261
Amazon	93,285	18,556	42,144	15,398	169,383
Total	3,401,725	860,134	1,842,342	289,213	6,393,414

Note: Data to the first of April 2013. Source: RLDatos de la Federación de Aseguradores Colombianos (FASECOLDA).

Table 2.
Distribution of the minimum sample size required per economic sector and region

Region \ Sector	Services	Commercial	Industry	Agricultural	Total
Andean	658	166	356	56	1.236
Caribbean	95	24	51	8	178
Pacific	47	12	25	4	88
Orinoquia	2	1	2	1	6
Amazon	17	4	9	1	31
Total	819	207	443	70	1.539

Note: Sample with a type 1 error of 0.05, a frequency estimation of 50% and a two-tailed frequency variation of 5%

Approximately 1,000 companies affiliated to an Occupational Risk Manager were invited to participate. Of these companies, 106 accepted the invitation and 16,095 of their workers responded fully to the battery. Convenience sampling was used rather than random sampling. However, given the size and distribution of the sample, there is no reason to think that the participating employees should present any kind of systematic bias related to their psychosocial conditions at work. Table 3 outlines the sample's sociodemographic characteristics. It is important to point out that the quotas were met in full, except for the agricultural and industrial sectors that could only be fully represented in the Andean region. The participants' average age was 34.8 years (*SD*= 9.2); 61.5% of the sample was female, and 38.5% was male. Table 3 lists the detailed data on schooling levels and job positions.

Instruments

The following criteria were used to select the instruments for the battery: a) it had to be possible to present them both on paper and by computer; b) their planning, application, and qualification had to be simple; c) they had to be valid and reliable; d) they had to have a supporting theoretical model whose validity, relevance, and basis had been published in national and international journals; and e) when possible, they needed to have been validated using Colombian samples.

The battery was made up of the following questionnaires and scales, which fulfilled the defined criteria:

Table 3.
Description of the final sample

Economic sector	Geographical Region									
	Amazon		Andean		Caribbean		Orinoquia		Pacific	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%*
Agricultural	0	0	45	100	0	0	0	0	0	0
Commercial	23	1.2	1720	92.8	107	5.8	2	0.1	2	0.1
Industry	1	0.1	1362	99	13	0.9	0	0	0	0
Services	40	0.3	10743	83.8	1975	15.4	42	0.3	20	0.2
Schooling							Frequency		Percentage	
Completed technical / technological							4399		27.3	
Completed high school							3818		23.7	
Completed professional level							2440		15.2	
Incomplete technical / technological							1833		11.4	
Completed post graduate							1450		9	
Incomplete professional level							1291		8	
Incomplete high school							346		2.1	
Incomplete post graduate							297		1.8	
Completed primary							111		0.7	
Incomplete primary							75		0.5	
Military career / police							21		0.1	
None							14		0.1	
Total							16095		100	
Occupation										
Technical activities							1699		10.6	
Other types of activities							1864		11.6	
Managerial, coordination or similar activities							2035		12.6	
Professional, scientific, intellectual or similar activities							2752		17.1	
Sales, service provision or similar activities							3537		22	
Operational activities							4208		26.1	
Total							16095		100	

* The percentages (%) correspond to the row; that is, per economic sector.

Job Content Questionnaire-JCQ.

This instrument was designed to measure the psychosocial characteristics of the conditions in which work is carried out in accordance with the DCS model (Johnson & Hall, 1988; Karasek, 1979; Karasek & Theorell, 1990). The results of the validation studies in Japan, Canada, Belgium, among others, in general show an adequate reliability of the scales (Cronbach's alpha of between 0.6 and 0.8), a factorial structure similar to the questionnaire, and an adequate predictive validity with different health indicators (cardiovascular disease, job satisfaction, anxiety, depression, negative emotionality) (Brisson, Blanchette, Guimont, Dion, Moisan & Vezina, 1998; Kawakami & Fujugaki, 1996; Kawakami, Kobayahi, Araki, Haratani & Furui, 1995; Pelfrene, Vlerick, Mak, Smets, Kornitzer & De Backer, 2001; Sale & Kerr, 2002). In Latin America, Araujo and Karasek (2008), Cedillo and Karasek (2003) and Gómez (2011) have published the results of similar studies.

Effort-Reward Imbalance (ERI) Questionnaire.

This instrument was designed to assess the components of the ERI model (Siegrist, 2002). The ERI questionnaire has already been assessed in different countries and languages with excellent psychometric results. For example, Eum et al. (2007) validated a Korean version; Griep, Rotenberg, Vasconcellos, Landsbergis, Comaru and Alves (2009), a Brazilian version; Msaouel et al. (2012), a Greek version; and Niedhammer, Siegrist, Landre, Goldberg and Leclerc (2000) validated a French version. Macías, Fernández, Hernández Cueto, Rancaño and Siegrist (2003) assessed a Spanish version of the ERI questionnaire, which resulted in a Cronbach's alfa value of over 0.80 and reported internal consistency, which was satisfactory for intrinsic reward and effort. This same scale in Spanish was assessed in Colombia by Gómez (2010) concluding that the ERI questionnaire, used with Colombian occupational samples presents psychometric characteristics that are similar to the original instrument and the translations validated in other languages.

Psychosocial Risk Factors Questionnaire.

This Bocanument–Norby questionnaire measures different intralabor factors and possible physical and psychological alterations derived from work. Unfortunately, and in agreement with Sarsosa, Arenas and Charria (2011), none of the publications that report having used the instrument (e.g., Bahamón & Zuluaga, 1993; Bocanument, 1994; Bocanument & Berjan, 1996) present information on the psychometric properties of the test. The only part of the questionnaire used in this battery was the scale that assesses manifestations of stress such as physiological, cognitive, emotional, and behavioral symptoms. Although the test does not fulfill all of the criteria used in this study for instrument selection, the authors decided to use it anyway given the ease with which it can be accessed and its broad diffusion in Colombia. By including this tool, we hope to offer the academic community information on the internal consistency of the scale chosen.

SF–36 Health Survey.

John E. Ware, Jr designed this scale as part of the Measures of Quality of Life Core Survey (MOS) developed by the RAND Corporation. Of the 40 scales assessed in the MOS study, eight were selected to make up the SF-36, as they were the most widely used among the health surveys and the most sensitive to variation by disease and treatment (Ware, 2013). The usefulness of the SF36 in detecting morbidity and sick population has been documented in a number of studies that have assessed health problems such as arthritis, backache, cancer, cardiovascular problems, chronic obstructive pulmonary disease, and depression (Turner-Bowker, Bartley, & Ware, 2002). More than 500 studies have been undertaken involving researchers from 22 countries (Ware, 2013). In Colombia, a number of studies have been carried out using this test, including those by Lugo, García and Gómez (2006) concluding that it is in fact reliable to test quality of life. In this battery, general health, mental health and vitality scales were used as they also were in other widely accepted instruments such as the ISTAS 21 (Moncada, Llorens & Kristensen, 2004).

The Whitehall Job Satisfaction Scale.

This scale measures a worker's level of satisfaction with his job. The original test was designed by Marmot in 1967 within the framework of the Whitehall II Study (Marmot, 2013) and subsequently incorporated into the Copenhagen Psychosocial Questionnaire (COPSOQ). The COPSOQ, including the satisfaction variable, has been used, adapted and standardized in various countries (Alvarado, Marchetti, Villalón, Hirmas & Pastorino, 2009; Blanch, Sahagún & Cervantes, 2010; Nübling, Stößel, Hasselhorn, Michaelis, & Hofmann, 2006). A Cronbach's alpha of 0.82 for the satisfaction scale was found in the last version of the COPSOQ (Pejtersen, Kristensen, Borg, & Bjorner, 2010). Spain's Trade Union Institute of Work, Environment and Health adapted the scale to Spanish within the framework of adaptation of the Danish COPSOQ to Spain (Moncada, Llorens & Kristensen, 2004) producing consistent results with the Danish and the German versions. Although the satisfaction has been standardized in Spain and used in

numerous Colombian studies, not enough evidence of its reliability in our context is available; thus, its use will be both useful for this study and it will provide information on its psychometric properties.

Eysenck Personality Inventory (EPI).

The goal for this test is to assess the personality traits of Psychoticism, Extraversion, Neuroticism and Social Desirability (Eysenck, 1968). Riso (1988) and Riso, Pérez, Roldán and Ferrer (1988) report information on the test's adaptation and psychometric properties for Colombia. Its reliability was of 0.79.

Modified Coping Strategies Scale (EEC-R).

This scale was designed and standardized for Colombia by Londoño et.al. (2006), in order to identify the coping strategies used by the individual assessed. The test's psychometric properties have been adequate up until now and its Cronbach's alpha is of 0.85.

*New tests and questionnaires***.**

Although the abovementioned tests cover most of the variables required by the norm, they do not measure sociodemographic, occupational, and extralabor characteristics or some intralaboral psychosocial risks. Complementary questionnaires were therefore built to assess the following intralabor variables: Physical demands, Job responsibility requirements, Emotional demands, Environmental demands, Working day, Change participation and management, Training, Role clarity, and Performance feedback. Finally, questions were designed to gather the sociodemographic, extralabor, and occupational information needed to contextualize the rest of the information pertaining to each worker.

Table 4 summarizes all the factors assessed and the tests used to measure them.

Table 4.
Scales description and reliability

Scale	Range	Min	Max	Media	Standard deviation	Cronbach's alfa
Psychosocial work factors						
Risk indicators						
Job strain [a]	3	0	3	0.83	0.247	*
Effort Reward Imbalance [b]	3	0	4	0.91	0.288	*
In job security [a]	12	4	16	6.34	1.754	0.517
Global demand [c]	169	52	221	121	19.482	0.889
Psychological work demands [a]	36	12	48	28.58	6.58	0.74
Physical demands [c]	12	4	16	8.14	2.503	0.785
Extrinsic effort [b]	15	5	20	12.78	2.641	0.725
Job responsibility requirements [c]	15	5	20	13.86	2.673	0.765
Emotional demands [c]	20	5	25	13.33	3.987	0.705
Environmental demands [c]	24	6	30	11.32	3.83	0.652
Working day [c]	24	6	30	13.58	4.498	0.725
Global control [c]	96	36	132	103.24	13.814	0.854
Change participation and management [c]	16	4	20	14.63	3.73	0.872
Training [c]	8	2	10	7.82	2.001	0.886
Role clarity [c]	9	3	12	10.43	1.524	0.812
JCQ control [a]	72	24	96	71.15	10.681	0.777
Use of skills [a]	36	12	48	37.82	5.317	0.701
Decision-making [a]	36	12	48	33.33	6.953	0.693
Global social support [c]	36	11	47	36.53	5.767	0.874
Performance feedback [c]	12	3	15	11.78	2.563	0.798
JCQ social support [a]	24	8	32	24.75	3.906	0.861
Manager or supervisor support [a]	12	4	16	12.08	2.401	0.841
Colleague support [a]	12	4	16	12.68	2.052	0.814
Reward [b]	33	11	44	31.91	4.872	0.823
Personality and Coping						
Intrinsic effort [b]	18	6	24	13.52	3.26	0.799
Neuroticism [g]	16	0	16	4.26	3.297	0.81

(Cont. Table 4)

Scale	Range	Min	Max	Media	Standard deviation	Cronbach's alfa
Negation [h]	15	3	18	8.38	2.897	0.605
Aggressive reaction [h]	25	5	30	8.86	3.345	0.75
Positive reassessment [h]	25	5	30	21.77	4.946	0.838
Seeking social support [h]	35	7	42	26.65	7.473	0.908
Seeking professional support [h]	25	5	30	12.75	6.114	0.905
Religion [h]	35	7	42	26.75	8.486	0.876
Wavering [h]	45	9	54	20.25	7.117	0.863
Problem resolution [h]	45	9	54	40.42	7.653	0.881
Emotional avoidance [h]	40	8	48	22.7	6.825	0.833
Cognitive avoidance [h]	25	5	30	15.67	4.59	0.779
Autonomy [h]	10	2	12	5.15	2.108	0.649
Health, Satisfaction and Reactions to stress						
Reactions to stress[d]	195	39	234	67	19.633	0.923
General health [e]	20	5	25	19.99	3.448	0.837
Mental Health [e]	25	5	30	25.34	4.298	0.836
Vitality [e]	20	4	24	18.21	3.855	0.866
Job satisfaction [f]	16	4	20	15.1	2.833	0.806

a. Job content questionnaire. b. Effort-reward questionnaire. c. Questionnaire for the complementary assessment of psychosocial risk. d. Questionnaire to measure psychosocial risk factors. e. SF – 36 Health Survey. f. Job satisfaction scale. g. Eysenck Personality Inventory (EPI). h. Modified Coping Strategies Scale (EEC-M). *There is no reliability calculation as it is not a single scale

Procedure

To develop the battery, the authors first identified the variables in Resolution 2646 of 2008 that could be assessed through self-reporting instruments. Next, they looked for instruments that would measure the identified variables and that fulfilled the previously established criteria, building new ones in those cases where no instruments with the defined criteria were found. To do so, they initially undertook a literature review on each variable and two of the authors for this study operationalized the variables. The definitions were subsequently validated with the rest of the authors. Once a consensus was reached, the items were drafted, and each item was reviewed and discussed by the research group until agreement was reached. Following this, the resulting battery was used in a pilot study that included eight workers assessing how well the technology worked for information gathering, the clarity of the instructions, the questions, and the response options. Finally, each participating company sent its workers a communication explaining the purpose of the study, the conditions, and forms of assessment. Those workers who could read, write, and use a computer were sent a link to the battery so that they could answer the questions at their work desk or from a computer room. Workers with reading, writing and/or computer use difficulties were assessed by a psychologist using the paper version of the battery. A very small number of people (83) needed this type of support.

The first part of the survey included the informed consent form, which, when responded to affirmatively, led the system to load the questions, and when responded to negatively, led the system to end the session. Those who answered the questionnaire were asked to write their suggestions, doubts, or the difficulties they may have encountered while completing the test, in order to obtain qualitative information to allow a complementary analysis of the statistics. Version 10 of the SPSS was used for the statistical analysis.

RESULTS

Below, the results are represented in two stages. The first stage consisted of the qualitative, reliability, and construct validity analyses of the questionnaires; the second involved predictive, concurrent and discriminant validity, and the calculation of the normalized scores.

Qualitative, reliability, and construct validity analyses

Qualitative, reliability, and construct validity analyses were undertaken to decide which items should remain in the battery and to confirm those items that can be grouped according to the theoretical structure of each instrument. Reliability was established based on the Cronbach's alfa and the construct validity was calculated through an exploratory factorial analysis of each test. The scales' and items' inclusion criteria were as follows: a) the workers'

comments should not indicate difficulties in understanding the items or the response options, b) the scales' Cronbach's alpha should be between 0.6 and 0.9, and c) the factorial analysis should show a structure that is in line with the theoretical model. It was also expected for the minimum factorial weight of each item on its respective factor to be 0.3, and in cases in which it weighed on two factors, this weight had to differ by at least 0.2. The descriptive data (mean, standard deviation, minimum and maximum) for each of the items was also analyzed.

Of the 2,558 comments obtained, some referred to topics unrelated to the test (complaints or comments that are particular to each company), and others to the extension of the battery (especially the personality inventory) and to items that were either difficult to understand or repetitive. These items were analyzed, concluding that most were negatively worded items, mostly pertaining to the personality inventory.

Eighty-eight items were removed from the battery after analysis, almost all belonging to the subscales of Extroversion, Psychoticism and Social Desirability from the EPI, and Expression of coping difficulty in the Modified Coping Scale. With the exception of the Neuroticism subscale, all the other personality inventories presented low reliability indices. Some of the items of the new questionnaire for the complementary assessment of psychosocial risk were eliminated as they were repetitive, and it was concluded that the remaining items and scales fulfilled the inclusion criteria. Table 4 shows the descriptive and reliability results of all the scales that make up the final version of the battery.

It is worth noting that the levels of reliability of the variables Job Insecurity and Reactions to Stress were of 0.52 and 0.93 respectively and were left in the final version of the test despite being either below or above the ideal values. Job Insecurity was considered a highly relevant variable in a context such as the Colombian one, which did not present difficulties with respect to other psychometric indicators. Its Cronbach's alpha value is close to 0.6, which is acceptable (Aiken, 2003), and other studies have reported similar values (Araujo & Karasek, 2008; Cedillo & Karasek, 2003; Gómez, 2010; Gómez, 2011; Gómez & Perilla, 2011). For Reactions to Stress, the value reached suggests that the information offered by the items is redundant, and this is to be expected given that stress is manifested in different organic systems that require exploration. The result is that the test contains many highly correlated items.

The factorial analyses of each of the instruments confirmed the proposed structure, with the exception of the Personality Inventory, in which only the subscale for Neuroticism presented the appropriate structure, as well as good reliability. It is for this reason that it was the only one that was left in the final version of the battery.

Validity and normalization analysis

The purpose of the predictive, concurrent, and discriminant analyses was to determine the battery's capacity to assess the aspects for which it was designed, to relate to other variables in the theoretically predicted way, and to differentiate groups according to expectation. The standard values were calculated to establish ranges that allow the comparison of individual and group scores with those obtained for other Colombian workers in similar occupations. Finally, the percentile range of each variable in the battery was calculated.

Given that the aforementioned analyses are sensitive to the composition of the sample, it was necessary to ensure that it was not biased and was as representative as possible of the country's regions and economic sectors. As such, a subsample of 2,834 workers that were randomly selected and proportional to the universe of workers was used. The subsample satisfactorily covered most of the required quotas per region and economic sector. All the sectors and regions were adequately represented except the agricultural sector.

Predictive validity.

To assess the capacity of the psychosocial risk factors to relate to each other as predicted in theory and as has been pointed out in previous studies, we calculated the correlations and linear regressions with the general indicators of the JCQ and ERI scales, the global psychosocial risk factors (demand, control and global support), and job security as predictors of general health, mental health, vitality, stress response, and job satisfaction as criterion variables. As expected, the psychosocial risk factors tended towards a positive association with the criterion variables (Table 5). However, the explained variation is minimal in some cases, such as, for example, how far general health can be predicted by global support. In other cases, such as job satisfaction, almost 40.96% of the variation can be explained based on the Rewards. It is interesting to note that the labor variables that most explain the variation of a number of the health indicators are effort-reward imbalance and job insecurity. On the other hand, general health is the variable in which the labor variables explain the smallest proportion of variation. This is not surprising considering the multiplicity of the biomedical and psychosocial factors that can be involved in its determination.

Table 5.
Correlations for the analysis of predictive validity.

Indicators for health Risk factors	Reactions to stress [+]	General health	Mental Health [+]	Vitality	Job satisfaction
Job strain [a+]	0.12**	-0.10**	-0.09**	-0.14**	-0.13**
Imbalance [b+]	0.26**	-0.14**	-0.23**	-0.24**	-0.39**
Insecurity [+]	0.24**	-0.19**	-0.23**	-0.22**	-0.32**
Global demand[c]	0.37**	-0.17**	-0.25**	-0.26**	-0.26**
Global control [d]	-0.11**	0.09**	0.08**	0.14**	0.31**
Global support [e]	-0.03**	0.06**	0.09**	0.06**	0.16**
Rewards	-0.37**	0.27**	0.34**	0.36**	0.64**

Some of the correlations were carried out by controlling confounding variables. [a] The Effort Reward Imbalance was controlled. [b] Job strain was controlled. [c] Global control and Global support were controlled. [d] Global support and Global demand were controlled. [e] Global demand and Global control were controlled. [+] The variable was normalized.
** p< .01 (bilateral).

Table 6 outlines the results of the regressions that were calculated in order to assess the job strain (JS) and effort-reward imbalance (ERI) indicators' capacity to predict the variables for health and wellbeing. Also assessed was the capacity of the global indicators—calculated using the new battery—and of job insecurity, to explain the variation beyond JS and ERI. Given that age is proven, from previous studies, to have a direct influence on general health and job satisfaction, it was controlled in the regressions calculated with these indicators. The results show that JS and ERI significantly explain the variation of all the selected indicators for health and wellbeing. The percentage of variation that they are able to explain is 5% (JS) and 2% (ERI) for general health; of 10 and 6% for stress response, vitality, and mental health; and 16 and 13% for job satisfaction. In all cases, the global demand, global control, and job insecurity significantly increased the predictive ability of the criterion variables, but this was always below the JS and ERI. Global social support significantly and directly helped to explain mental health, general health and general satisfaction. In the cases of stress response and vitality, its direct contribution was not significant. However, it is possible that in such cases, the role of social support may be that of a moderator of the working conditions, which is a hypothesis that has not been assessed in this study.

Discriminant validity.

This procedure allowed us to establish the instrument's capacity to differentiate or discriminate among workers in different occupational groups or economic sectors, as it should discriminate theoretically or as previous studies have shown.

The discriminant validity was calculated by means of a variation analysis (ANOVA) using the indicators for JS, ERI, psychological demands, physical demands, emotional demands, global control, JCQ control, decision-making, use of skills, global social support, and JCQ social support. Table 7 outlines the occupational groups that are discriminated by the psychosocial variables. For example, the JS differentiates workers in professional, scientific, and intellectual jobs from those who work in operational positions, the latter presenting a higher JS- ($p< 0.01$); and job control measured by the JCQ and global control differentiate managerial staff from technicians and blue collar workers ($p<0.001$). As expected, the latter report a lower perception of control. Physical demands discriminate managerial personnel from technicians, professionals, and scientists from operational workers ($p< 0.01$), whose levels of physical demand are higher. Finally, as expected, emotional demands are significantly higher in managerial and service professionals than in all other workers ($p< 0.01$).

In terms of the sector, differences were found in JS, physical and emotional demands, decision-making, and control (of JCQ). Industrial sector workers report higher JS than service sector workers, and, as expected, workers in the commercial and industry sector are subject to greater levels of physical demand than those in the services sector. Also, as expected, emotional demands are greater in the commercial and services sector than in the industrial and agricultural sectors. Agricultural workers report lower control and decision-making levels than the other sectors. All these differences were significant ($p< 0.01$).

Table 6.
Lineal regressions of global risk factors on the criterion variables

	Dependent Variables																			
	Reactions to stress +				General health *				Mental health +				Vitality				Satisfaction*			
Predictors	B	SE	Beta	R^2	B	SE	Beta	R^2	B	SE	Beta	R^2	B	SE	Beta	R^2	B	SE	Beta	R^2
Step 1				0.10				0.05				0.07				0.11				0.16
Age																	0.02	0.00	0.06**	
Job strain +	0.28	0.02	0.31**		-50.72	0.48	-0.22**		-0.18	0.01	-0.26**		-90.48	0.51	-0.33**		-80.40	0.37	-0.39**	
Step 2				0.15				0.07				0.12				0.16				0.29
Age																	0.02	0.00	0.07**	
Job strain +	0.12	0.02	0.13**		-30.08	0.59	-0.12**		-0.07	0.01	-0.10**		-40.67	0.62	-0.16**		-20.65	0.42	-0.12**	
E/R Imbalance +	0.27	0.02	0.30**		-40.41	0.59	-0.17**		-0.18	0.01	-0.27**		-80.03	0.61	-0.28**		-90.59	0.42	-0.45**	
Step 3				0.19				0.09				0.14				0.17				0.40
Age																	0.02	0.00	0.08**	
Job strain +	0.06	0.02	0.07*		-0.20	0.68	-0.01		0.01	0.02	0.01		-20.79	0.67	-0.10**		10.75	0.45	0.08**	
E/R Imbalance +	0.11	0.02	0.12**		-10.15	0.76	-0.04		-0.08	0.02	-0.12**		-70.35	0.61	-0.26**		-60.91	0.50	-0.33**	
Global demand	0.00	0.00	0.30**		-0.03	0.01	-0.16**		-0.00	0.00	-0.20**						-0.02	0.00	-0.10**	
Global control					0.07	0.01	0.17**		0.00	0.00	0.16**		0.07	0.01	0.15**		0.14	0.01	0.41**	
Step 4				0.21				0.09				0.16				0.18				0.41
Age																	0.02	0.00	0.07**	
Job strain +	-0.02	0.02	-0.03		-0.15	0.67	-0.01		0.01	0.02	0.01		-10.53	0.70	-0.05*		10.79	0.44	0.08**	
E/R Imbalance +	0.05	0.02	0.06*		-0.56	0.77	-0.02		-0.06	0.02	-0.09*		-40.63	0.80	-0.16**		-60.33	0.51	-0.30**	
Global demand	0.00	0.00	0.35**		-0.03	0.01	-0.16**		-0.00	0.00	-0.21**		-0.03	0.01	-0.15**		-0.02	0.00	-0.10**	
Global control	-0.00	0.00	-0.18**		0.06	0.01	0.15**		0.00	0.00	0.14**		0.08	0.01	0.17**		0.14	0.01	0.39**	
Job insecurity					-0.17	0.04	-0.09**		-0.01	0.00	-0.13**						-0.17	0.02	-0.11**	
Step 5				0.22				0.10				0.16				0.19				0.42
Age																	0.02	0.00	0.08**	
Job strain +	-0.03	0.02	-0.03		-0.45	0.68	-0.02		0.00	0.02	0.00		-10.49	0.70	-0.05*		10.44	0.45	0.07**	
E/R Imbalance +	0.02	0.02	0.03		0.05	0.79	0.00		-0.04	0.02	-0.07*		-40.04	0.80	-0.14**		-0.59	0.52	-0.26**	
Global demand	0.00	0.00	0.35**		-0.03	0.01	-0.16**		-0.00	0.00	-0.20**		-0.03	0.01	-0.15**		-0.01	0.00	-0.09**	
Global control	-0.00	0.00	-0.16**		0.05	0.01	0.11**		0.00	0.00	0.09**		0.7	0.01	0.16**		0.11	0.01	0.33**	
Job insecurity	0.01	0.00	0.12**		-0.17	0.04	-0.09**		-0.01	0.00	-0.12**		-0.17	0.04	-0.08**		-0.16	0.02	-0.10**	
Global social support					0.05	0.01	0.08*		0.00	0.00	0.08**						0.06	0.01	0.12**	

Note: + Normalized variable. *p<.05 **p<.01

Concurrent validity.

The purpose of using this method was to establish whether variables that measure theoretically close concepts and are therefore highly correlated, effectively did have this type of relationship. The results of the correlation are presented in Tables 8 and 9 and show levels of association in the direction and levels theoretically expected. For example, job strain and effort-reward imbalance—two close but not identical concepts that reflect negative psychosocial aspects at work—correlate significantly (r= .598), as a value similar to the value obtained by Gómez (2011) using Colombian samples.

Table 7.
Discrimination analysis per occupation and economic sector based on the assessed psychosocial risk factors

	Per occupation		Per sector	
	F (5, 2828)	Sig.	F (3, 2830)	Sig.
Job strain +	6.244	0.000	3.179	0.023
Effort Reward Imbalance +	5.921	0.000	0.685	0.561
Global control	7.857	0.000	2.005	0.111
Global social support	3.667	0.003	1.191	0.312
Physical demands	44.94	0.000	23.983	0.000
Emotional demands	14.197	0.000	14.423	0.000
Use of skills +	21.822	0.000	1.578	0.193
Psychological work demands	9.136	0.000	1.237	0.295
Decision-making	23.574	0.000	11.938	0.000
JCQ control	29.455	0.000	7.155	0.000
JCQ social support	2.156	0.056	1.301	0.272

+ Normalized variable.

Table 8.
Correlations for the analysis of concurrent validity among independent variables

	Job strain +	Extrinsic effort	Working day	Performance feedback
Effort Reward Imbalance +	0.592**			
Psychological work demands		0.648**	0.401**	
Extrinsic effort			0.458**	
Manager or supervisor support				0.571**

Normalized variable + ** p < .01 (bilateral)

Table 9.
Correlations for the analysis of concurrent validity among dependent variables

	Reactions to stress +	Mental Health +	General health	Vitality
Reactions to stress +				
Mental Health +	-0.624**			
General health	-0.468**	0.409**		
Vitality	-0.632**	0.670**	0.513**	
Job satisfaction	-0.386**	0.369**	0.308**	0.452**

Normalized variable + ** p < .01 (bilateral)

Standardization.

None of the variables contemplated for this battery or other similar ones have empirically established cut-off points that allow a precise prediction of the sector of workers that will effectively develop a disease. As such, the best available means to establish a qualitative assessment of the scores is to use population distribution as a reference mechanism to compare the values obtained by an individual or a group.

The standard values were established by calculating the minimum and maximum values, the means, standard deviations, and percentile points of each variable. Percentile scores were used given that they can quickly and easily establish the relative position of each assessed individual or group with respect to a reference group. The percentiles were divided into 5 groups to represent Very low, Low, High, Very high levels of risk.

It should be noted that for the case of the JS and ERI indicators, other studies have pointed out that scores equal to or greater than 1 are associated with higher risk and—when exposure to such conditions is maintained and combined with other vulnerability conditions—with illness. Thus, this is an important cut-off point to consider regardless of the results obtained in this standardization (Gómez, 2010 and 2011).

DISCUSSION

The purpose of this study was to build and validate a battery that overcomes some of the limitations identified in the Ministry of Social Protection's battery of psychosocial risk factors. To do this, a battery was designed and its internal consistency assessed along with its construct validity, predictive validity, and discriminatory, and concurrent validity. Normalized scores for Colombia were also calculated allowing the comparison of the workers assessed with the country's working population affiliated to the Social Security System.

The psychometric quality indicators (internal consistency and construct validity) of all the battery components are adequate, coinciding with previous studies on some of the instruments used in Colombian samples (e.g., Gómez, 2010 & 2011; Londoño et.al., 2006; Lugo, García & Gómez, 2006; Riso, 1988; Riso, Pérez, Roldán & Ferrer, 1988). It confirms both that the new scales were designed appropriately and that computer application does not affect the consistency and validity of the instruments. Some of the scales (Neuroticism, EPI; Job satisfaction, Whitehall 2; and Reactions to stress, psychosocial risks factors questionnaire) used in Colombia but with no available reliable published data, obtained results that supported their use in the country.

The indicators for psychosocial risk included in this battery had, as expected, significant associations with the indicators for perception of general health, mental health, vitality, job satisfaction, and with symptoms of stress in a sample of workers representative of the workers affiliated to the social security system. It is worth highlighting the indicators for JS and ERI that explained the greatest proportion of the variation of the indicators for health and wellbeing used. In all cases, the composite indicators (JS and ERI) predict the greatest variation of all the indicators for health and wellbeing. At the beginning of this work, it was argued that these indicators, despite not considering all the information suggested in Resolution 2646 for their measurement, would efficiently predict physical and psychological health risks. This result proved us right.

The global indicators, calculated on the basis of information from the JCQ, other new scales, and job insecurity, add significant explanation even though the proportion is not so high (with the exception of job satisfaction). Thus, the indicators JS and ERI can be used, without risking the loss of information that would indicate a need to intervene. However, these global indicators include additional information—suggested by Resolution 2646—that adds detail about the work conditions that may be subject to preventive and corrective actions.

The labor risk indicators also discriminate between occupational groups and economic sectors, as expected, according to existing knowledge about the general characteristics of these groups and sectors. More specific discrimination analysis between occupations may be developed in time as sufficient data on specific occupational groups is gathered; this cannot be done with the existing battery. These analyses may then be compared to those carried out in previous studies (Karasek et. al, 1998).

Given the results presented in this document, it can be affirmed that the battery designed and assessed overcomes the limitations of the Ministry's battery listed at the beginning of this paper. It can be administered on paper or by computer; it will allow comparisons between occupations; it reduces complexity in terms of the planning and application of tests; it obtains unified scores per variable, it offers a diagnosis of a large number of variables suggested in Resolution 2646; and it will allow the comparison of results obtained for Colombian workers with those obtained for workers in other countries, using the values obtained in the JCQ and ERI scales, fully included in this battery.

The validation of this work presents outstanding strengths such as the fact that it is theoretically coherent with the ideas set out in more sustained models in terms of their predictive ability for health problems in workers in any

occupation. The sample of working population affiliated to the Colombian Social Security System, was of an unusual size for this type of study, and this can exceed the limitations that can derive from the convenience sampling. These final details add confidence and value to the quality of the results obtained and of the possibilities that the use of this battery opens for organizations that decide to use it.

Despite the strengths pointed out, the battery has a number of limitations. One of them is the fact that the agricultural and livestock sector is not adequately represented in the sample, thus when assessing workers in this sector, care has to be taken in comparing them with those represented in this battery. Another limitation is represented by the number of criterion variables used for its validation. In future, it will be necessary to add other indicators for health, in particular those that are objective indicators for mental and physical health, as well as performance indicators. Currently, access to the battery is limited given that the permissions granted by the authors of the JCQ and ERI questionnaires do not extend to free distribution or sale. However, for now, it is being used by a private company (Consulting company PRAX S.A.S) and by the Stress and Health research group to offer services to interested companies and undertake research that allows the national community access to information regarding some of the health and wellbeing conditions for those affiliated to the Colombian Social Security System, and their relationship to psychosocial conditions at work. In the future, thanks to the alliance established between a private company and one of the university's research groups, recognized by Colciencias, we hope to amplify the information assessed via the battery, carry out longitudinal research studies, and assess the impact of the interventions among other types of projects.

REFERENCES

Aiken, L. (2003). *Tests psicológicos y evaluación*. México: Prentice Hall.

Alvarado, R., Marchetti, N., Villalón, M., Hirmas, M. y Pastorino, M. S. (2009). Adaptación y análisis psicométrico de un cuestionario para evaluar riesgos psicosociales en el trabajo en Chile: versión media del CoPsoQ. *Rev. chil. salud pública, 13*(1), 7-16.

Araujo, T. & Karasek, R. (2008). Validity and reliability of the job content questionnaire in formal and informal jobs in Brazil. *Scandinavian Journal of Work, Environment & Health, Supp. 6*, 52–59.

Bahamón, N. y Zuluaga, L. (1993). *Factores de riesgo psicosociales en los trabajadores de los institutos descentralizados afiliados a Capreneiva*. Tesis de grado Especialización en Salud Ocupacional. Facultad de Salud Pública. Universidad de Antioquia.

Blanch, J. M., Sahagún, M., & Cervantes, G. (2010). Estructura Factorial del Cuestionario de Condiciones de Trabajo. Factor Structure of Working Conditions Questionnaire. *Revista de Psicología del Trabajo y de las Organizaciones, 26*(3), 175-189.

Bocanument, G. (1994). Naturaleza, origen, clasificación y evaluación de los riesgos psico sociales del trabajo. *Administración de personal. 16*(52) (Jul–Sep).

Bocanument, G. y Berjan, P. (1996). Encuesta para la identificación cuantitativa de los factores de riesgo psicosocial. En: *Seguro Social Protección Laboral, editor. Factores de riesgo psicosocial.* Documento técnico. Bogotá: ECOSAD. pp. 17– 25.

Bosma, H., Peter, R., Siegrist, J., & Marmot, M. (1998). Two alternative job stress models and the risk of coronary heart disease. *American Journal of Public Health January, 88*(1), 68-74. doi: 10.2105/AJPH.88.1.68

Brisson, C., Blanchette, C., Guimont, C., Dion, G., Moisan, J., & Vezina, M. (1998). Reliability and validity of the French version of the 18 item Karasek Job Content Questionnaire. *Work and Stress, 12*, 322-336.

Calnan, M., Wainwrite, D. & Almond, D. (2000). Job Strain, effort-reward imbalance and mental distress: A study of occupations in general medical practice. *Work & Stress, 14*(4), 297-311.

Cedillo L, & Karasek R. (2003). *Reliability and Validity of the Spanish Version of the Job Content Questionnaire Among Maquiladora Women Workers*. Massachusetts: JCQ-Center. Recuperado de http://www.jcqcenter.org.

Comité Mixto OIT-OMS (1984). Factores Psicosociales en el Trabajo: Naturaleza, incidencia y prevención. *Seguridad, Higiene y Medicina del Trabajo, 7.*

Eum, K., Li, J., Lee, H., Kim, S., Paek, D., Siegrist, J. & Cho, S. (2007). Psychometric properties of the Korean version of the effort-reward imbalance questionnaire: a study in a petrochemical company. *International Archives of Occupational and Environmental Health, 80*(8), 653-661, doi: 10.1007/s00420-007-0174-3 .

Eysenck, H. J. (1968). *Eysenck personality inventory*. San Diego: Educational and Industrial Testing Service.

Ganster, D. C., & Schaubroeck, J. (1991). Work stress and employee health. *Journal of Management, 17*, 235-271.

Gómez, V. (2010). Assessment of psychosocial stressors at work: Psychometric properties of the Spanish version of the ERI (Effort-Reward Imbalance Questionnaire) in Colombian Workers. *Revista de Psicología del Trabajo y de las Organizaciones*, *26*(2), 147-156.

Gómez, V. (2011). Assessment of psychosocial stressors at work: psychometric properties of the JCQ in Colombian workers. *Revista Latinoamericana de Psicología, 43*(2), 125-138.

Gómez, V. y Perilla, E. (2011). Tensión laboral en varios grupos ocupacionales colombianos: Validación del modelo Demanda-Control y del instrumento JCQ. *Revista Ciencia & Trabajo, 13*(42), 208-216.

Griep, R., Rotenberg, L., Vasconcellos, A., Landsbergis, P., Comaru, C., & Alves, M. (2009). The psychometric properties

of demand-control and effort-reward imbalance scales among Brazilian nurses. *International archives of occupational and environmental health, 82*, 1163-1172, doi: 10.1007/s00420-009-0460-3.

Johnson, J.V., & Hall, E. (1988) Job strain, workplace social support and cardiovascular disease: A cross-sectional study of a random sample of the Swedish working population. *American Journal of Public Health, 78*(10), 1336-1342.

Johnson, J.V., Stewart, W., Hall E. M., Fredlund, P., & Theorell, T. (1996). Long-Term Psychosocial Work Environment and Cardiovascular Mortality among Swedish Men. *American Journal of Public Health, 86*(3), 325-331.

Johnson, J.V., Hall, E.M., & Theorell, T. (1989). Combined effects of job strain and social isolation on cardiovascular disease morbidity and mortality in a random sample of the Swedish male working population. *Scandinavian Journal of Work, Environment & Health 15*(4), 271-279.

Karasek R.A. (1979). Job demands, job decision latitude and mental strain: Implications for job redesign. *Administrative Science Quarterly, 24,* 285-307.

Karasek, R., Gardell, B., & Lindell, J. (1987). Work and non-work correlates of illness and behaviour in male and female Swedish white collar workers. *Journal of Organizational Behavior, 8*, 187-207

Karasek, R., Brisson, Ch., Kawakami, N., Houtman, I., Bongers, P., & Amick, B. (1998). The Job Content Questionnaire (JCQ): An instrument for Internationally Comparative Assessments of Psychosocial Job Characteristics. *Journal of Occupational Health Psychology, 3*(4), 332-355.

Karasek, R & Theorell, T. (1990). *Healthy work. Stress, productivity and the reconstruction of Working Life.* U.S.A: BasicBooks. HarperCollins Pub.

Karasek, R.A., Baker, D., Marxer, F., Ahlbom, A., & Theorell, T. (1981). Job Decision Latitude, Job Demands, and Cardiovascular Disease: A Prospective Study of Swedish Men. *American Journal of Public Health, 71*(7), 694-705.

Kawakami, N., & Fujigaki, Y. (1996). Reliability and validity of the Japanese version Job Content Questionnaire: Replication and extension in computer company employees. *Industrial Health, 34*, 295 – 306.

Kawakami, N., Kobayahi, F., Araki, S., Haratani, T., & Furui , H. (1995). Assessment of job stress dimensions based on the job demands-control model of employees of telecommunication and electric power companies in Japan: Reliability and validity of the Japanese version of the Job Content Questionnaire. *International Journal of Behavioral Medicine, 4*, 358-375.

Kinman, G., Jones, F. & Kinman, R. (2006). The Well-being of the UK Academy, 1998–2004. *Quality in Higher Education, 12*(1), 15-27.

Kristensen, T. S. (1995). The Demand-Control-support model: Methodological challenges for future research. *Stress Medicine, 11*, 17-26.

Kristensen, T. S. (1996). Job stress and cardiovascular disease: A theoretic critical review. *Journal of Occupational Health Psychology, 1*(3), 246-60.

Lazarus, R. (1999). *Stress and Emotion: A New Syntesis*. New York: Springer Publising Company.

Londoño, N. H., Henao López, G. C., Puerta, I. C., Posada, S., Arango, D., & Aguirre-Acevedo, D. C. (2006). Propiedades psicométricas y validación de la Escala de Estrategias de Coping Modificada (EEC-M) en una muestra colombiana. *Universitas Psychologica, 5*(2), 327-350.

Lugo, L. H., García, H. I., y Gómez, C. (2006). Confiabilidad del cuestionario de calidad de vida en salud SF-36 en Medellín, Colombia. *Rev Fac Nac Salud Pública, 24*(2), 37-50.

Lundberg, U., & Cooper, C. L. (2011). *The science of occupational health*. Chichester, UK: Wiley-Blackwell.

Macías Robles, M. D., Fernández López, J. A., Hernández Mejía, R., Cueto Espinar, A., Rancaño, I., & Siegrist, J. (2003). Evaluación del estrés laboral en trabajadores de un hospital público español. Estudio de las propiedades psicométricas de la versión española del modelo <<Desequilibrio esfuerzo-recompensa>>. *Medicina Clínica, 120*(17), 652-657.

Marmot, M. (2013). *Whitehall II History*. UCL Research Department of Epidemiology and Public Health Web Site. Recuperado de http://www.ucl.ac.uk/whitehallII/history

Ministerio de la Protección Social (2008). *Resolución 2646 de julio 17 de 2008.* Diario Oficial 47059 de julio 23.

Ministerio de la Protección Social, Pontificia Universidad Javeriana (2010). *Batería de instrumentos para evaluación de factores de riesgo psicosocial. Manual general de la batería de instrumentos.* Bogotá: Ministerio de la Protección Social República de Colombia. Recuperado de http://fondoriesgoslaborales.gov.co/documents/Publicaciones/Estudios/Bateria-riesgo-psicosocial-1.pdf

Ministerio de la Protección Social. (2011). Respuesta a derecho de petición número 00279985 del 15 de Septiembre de 2011.

Moncada, S., Llorens, C., & Kristensen, T. S. (2004). Método ISTAS 21 (CoPsoQ). *Manual para la evaluación de riesgos psicosociales en el trabajo*. Instituto Sindical de Trabajo, Ambiente y Salud (ISTAS). Paralelo Ediciones SA.

Msaouel, P., Keramaris, N., Apostolopoulos, A., Syrmos, N., Kappos, T., Tasoulis, A., Tripodaki, E.-S., Kagiampaki, E., Lekkas, I. & Siegrist, J. (2012). The Effort-reward Imbalance Questionnaire in Greek: Translation, Validation and Psychometric Properties in Health Professionals. *Journal of Occupational Health, 54* (2), 119-130.

Niedhammer, I., Siegrist, J., Landre, M., Goldberg, M. and Leclerc, A. (2000). Étude des qualités psychométriques de la version francaise du modèle d'équilibre Efforts/Recompenses. *Revue d'Epidemiologie et de Santé Publique, 48*, 419-437.

Nübling, M., Stößel, U., Hasselhorn, H. M., Michaelis, M., & Hofmann, F. (2006). Measuring psychological stress and strain at work-evaluation of the COPSOQ Questionnaire in Germany. *GMS Psycho-Social Medicine, 3*, 1-14.

Pejtersen, J. H., Kristensen, T. S., Borg, V., & Bjorner, J. B. (2010). The second version of the Copenhagen Psychosocial Questionnaire. *Scandinavian journal of public health, 38*(3 suppl), 8-24.

Pelfrene, E., Vlerick, P., Mak, R., De Smet, P., Kornitzer, M., & De Backer, G. (2001). Scale reliability and validity of the Karasek' Job Demand–Control–Support model in the Belstress study. *Work and Stress, 4*, 297 – 313.

Peter, R., Siegrist, J. Hallqvist, J., Reuterwall, C. & Theorell, T. (2002). Psychosocial work environment and myochardial infarction: Improving risk estimation by combining two complementary job stress models in the SHEEP Study. *Journal of Epidemiology and Community Health, 56,* 294-300.

Riso, W. (1988). *Entrenamiento asertivo: aspectos conceptuales, evaluativos y de intervención.* Medellín: Formar.

Riso, W., Pérez, G. M., Roldán, L., y Ferrer, A. (1988). Diferencias en ansiedad social, creencias irracionales y variables de personalidad en sujetos altos y bajos en asertividad (tanto en oposición como en afecto). *Revista Latinoamericana de Psicología, 20*(3), 391-400.

RLDatos–FASECOLDA–(2013). *Reporte de Trabajadores afiliados al sistema de riesgos laborales*. Recuperado de https://sistemas.fasecolda.com/rldatos/Reportes/xClaseGrupoActividad.aspx

Sale, J. E. M., & Kerr, M. S. (2002). The psychometric properties of Karasek's demand and control scales within a single sector: data from a large teaching hospital. *International Archives of Occupational Environmental Health, 75*, 145-152.

Sarsosa, K. V., Arenas, F. y Charria, V. H. (2011). Factores de riesgo psicosocial laboral: métodos e instrumentos de evaluación. *Revista Facultad Nacional de Salud Pública, 29*(4), 380-391.

Semmer, N. K., & Meier, L. L. (2009). Individual differences, work stress, and health. In C. L. Cooper, J. Campbell Quick, & M. J. Schabracq (Eds.). *International handbook of work and health psychology* (3rd ed., pp. 99-121). Chichester, UK: Wiley.

Siegrist, J. (2002). Effort-Reward Imbalance at Work and Health. En: P.L. Perrewé & D.C. Ganster (Eds.) *Historial and Current Perspectives on Stress and Health* (Vol. 2). Emerald Group Publishing Limited, pp.261–291.

Schnall, P. L., Belkic, K., Landsbergis, P. L., & Baker, D. (2000). Why the workplace and cardiovascular disease? In P. L. Schnall, K. Belkic, P. Landsbergis, & D. Baker (Eds.). *Occupational Medicine: State of the Art Reviews, 15*(1), Philadelphia: Hanley and Belfus.

Theorell, T., & Karasek, R. A. (1996). Current issues relating to psychosocial job strain and cardiovascular disease research. *Journal of Occupational Health Psychology, 1*, 9 – 26.

Tsutsumi, A., Kayaba, K., Theorell, T., & Siegrist, J. (2001). Association between job stress and depression among Japanese employees threatened by job loss in a comparison between two complementary job-stress models. *Scandinavian Journal of Work, Environment & Health, 27*(2), 146-153.

Turner-Bowker, D.M., Bartley, P.J., & Ware, J.E., Jr. (2002). *SF-36® Health Survey & "SF" Bibliography*: Third Edition (1988-2000). Lincoln, RI: QualityMetric Incorporated.

Van der Doef, M., & Maes, S. (1999). The Job Demand-Control (-Support) Model and psychological well-being: a review of 20 years of empirical research. *Work Stress, 13*, 87–114.

Villalobos, G. H., Vargas, A. M., Rondón, M. A., & Felknor, S. A. (2013). Design of psychosocial factors questionnaires: A systematic measurement approach. *American Journal of Industrial Medicine*, *56*(1), 100-110.

Ware, J. E. (2013). SF-36® Health Survey Update. *The SF Community*. Recuperado de http://www.sf-36.org/tools/sf36.shtml

Winefield, A., Gillespie, N., Stough, C., Dua, J., Hapuarachchi, J. & Boyd, C. (2003). Occupational stress in Australian university staff: Results from a national survey. *International Journal of Stress Management, 10* (1), 51-63.