

Occupational Stress: Reviewing the Job Demands-Control-Support Model

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Abstract

The present piece of work empirically analyses the Job Demand-Control-Support Model (JDSC Model), from the Andalusian Job Conditions Survey (2008), in order to predict the Mental strain experienced by individuals in their working place. Thus, competitive models to assess the significance and intensity on the three above-mentioned constructs, as well as to assess the potential moderating effects of the Control and Support perceived on the Demand, are proposed. Moreover, the individual own characteristics and the activity sector where professional life is developed are introduced. Among the main results, it is to be highlighted that the optimum model shows the existence of a positive relation between work Demand and a the Mental strain perceived, as well as negative effects related to the Control and Support perceived constructs. Also, moderating factors evidence has not been found, although it has been observed that women and individuals working in the Service Sector perceive lower Mental strain levels, whereas as age increases the tension of the individual also increases.

Key words:

Job Demand-Control-Apoyo Model (JDCS Model); Occupational Stress; Andalusian Survey on Working Conditions.

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Introduction

The importance of stressors on the occupational health of workers has become in recent years a relevant and growing recognition subject, both from an academic perspective and from the point of view of government and business organizations. On the one hand, issues such as corporate social responsibility and social concern for the prevention of occupational risks (Montero, Araque and King, 2009), and, secondly, the evidence shown in numerous studies which emphasise the strong positive relationship between stress and illness (Martin et al., 2007, Wang et al., 2009, Forcella et al., 2009; Courvoisier and Perneger, 2009, Nomura et al., 2009; Lallukka, et al., 2009 .) have contributed to this.

Work stress is considered a mismatch between the skills, perceived or real, of an individual and the needs, perceived or real, of the environment (Lazarus and Folkman, 1986).

That is, work-related stress occurs when a correct matching between the person and the work he/she develops does not happen, either because his/her skills and abilities do not meet those required by the job, or because it does not suit his/her needs or expectations, or it does not allow him/her to perform his/her knowledge or skills. When these conditions become chronic, there is a mental strain on workers that may impair their physical and / or psychological health. Knowing and understanding the relationship between that damaging tension and the conditions that generate it has led to numerous scientific studies in the recent decades. Different explanatory models have also been developed, the most widely used being: JDCS psychosocial model of "Demands-Control-Support" (Johnson and Hall, 1988, Karasek and Theorell, 1990), and the model of "Effort-Reward" (Siegrist, 1996).

Knowledge of the factors of stress, or stressors, in the workplace has significant implications for the redesign of jobs in an organization. It allows to know how to influence variables to reduce mental strain even when there is a high level of demands or working requirements. Furthermore, such knowledge is equally useful for planning strategies and policies, improve responsiveness, and prioritize the actions of the Public Administration. In fact, the Administrations have led their own working conditions studies with the overall objective of generating a base on which to develop specific prevention programmes, sectorial and vertical, and promote specific preventive actions, as well as to deepen the already initiated.

This paper is done from a comprehensive secondary database, more specifically, the first survey on working conditions carried out in Andalusia, by the Andalusian Institute of "Prevención de Riesgos Laborales" (Occupational Health and Safety), "Consejería" (Regional Ministry) of Employment, Regional Government of Andalusia. The mentioned survey had the main objective of deepening the analysis of working conditions and occupational hazards in Andalusia in 2008. Among other topics, this survey addressed the psychosocial risks to which workers are exposed in their jobs

From that database and the theoretical framework of JDCS psychosocial model of "Demands-Control-Support", the main objective of this research is carried out in a deeper understanding of the psychosocial factors of work stress. The richness of the data, provided by such a large and multi-sector sample of workers, will firstly allow a deeper research of the determinants of occupational stress in Andalusia and, secondly, it will enable to deepen the knowledge of the structure of relationships proposed in the psychosocial model JDCS.

Thus, the paper is structured as follows: First of all, it outlines the main features of the objective model and the debate issues addressed in the empirical exercise. Secondly, we argue the construction of the psychosocial constructs. Third, we explain the database and the methodology used, followed by the main results. Finally, conclusions and implications for management are presented.

Conceptual Framework

In order to analyse the background of psychosocial risks in the workplace, a large majority of researchers are based on the Karasek's Demand-Control Model (JDC; Karasek, 1979). This model suggests that mental strain at work and its physical and psychological consequences result from the interaction of job demands and the control over them. Demands of work are defined as: mental overcharge, that is to say, organizational constraints to perform the tasks, or conflicting demands, and Job control refers to the possibility of making decisions and using one's own capabilities.

In the 80s, the model was widely deployed, and its most important extension was the incorporation of a third dimension: Social Support in the workplace. According to the extended model: Demand-Control-Support (JDCS Model), the highest risk of physical and psychological problems would occur in isolated groups with jobs characterized by high demands, low control and low social support (Johnson and Hall, 1988 ; Karasek and Theorell, 1990).

The initial work of Karasek has led to a large number of psychosocial factors modeling studies in work stress conceptualization, and its effect on job satisfaction, employee productivity, quality of life or the existence of physical and / or mental illnesses (Table 1). Thus, reading from Table 1 it is noted that there are some discrepancies in the literature; there are even contradictory evidence or quite different approaches. In this sense, we can set down at least three key areas of debate: how many and how to define and operate psychosocial factors or stressors; the potential existence of moderating effects among the variables considered in the model (Demand-Control-Support) and the variables to explain; and, finally, the inclusion of control variables in the model. The following are those aspects in detail.

For consideration of the number of stressors and indicators, it is noteworthy that authors like Schaufeli and Bakker (2004), Bakker AB, Demerouti, E. and Verbeke, W. (2004), Cabezas (2007) and Martin et al. (2007) propose the grouping of Control and Support on a single factor, in addition, in an attempt to improve the predictive ability of job stress they include indicators related to financial and organizational resources. On the other hand, other authors maintain the three original factors independently (Demand-Control-Support).

Table 1. Studies of Job Stress from Karasek's proposals

| Year | Authors | Exogenous variables | Endogenous variables |
|------|-----------------------------|---|---|
| 1979 | Karasek | Decision latitude: US: Skill discretion (4 items)/Decision authority (4 items) Sweden: Intellectual discretion (2 items)/ Expert rating of skill level required Job demands: US (7 items)/ and Sweden (2 items) | US: Exhaustion/ Depression/ Job satisfaction/ Life satisfaction Sweden: Exhaustion/ Depression/ Pill consumption/ Sick days |
| 1990 | Karasek | Change influence (2 items) Task control changes (7 items) | Physical illness Psychological distress |
| 1995 | Wall, Jackson and Mullarkey | Demands: Monitoring demands (4 items) Problems solving demands (5 items) Production responsibility (5 items) | Perceived intrinsic job characteristics scale (PICS) -Job complexity |
| 1996 | Wall et al. | Demands: Monitoring demands(4 items) Problems solving demands (3 items) Control: Timing (4 items); Methods (6 items) | Job satisfaction (scale) Depression and anxiety (6 items of Mental health) |
| 2000 | Sargent and Terry | Work overload (11 items) Task control (6 items) Social Support (6 items) | Job satisfaction Depersonalization Supervisors assessment of work performance |
| 2000 | Janssen | Job demands (8 items) Effort-Rewards ("buffer") | Innovative work behaviour |
| 2000 | Cabezas | Demands (12 items) Resources (22 items) | Quality of working life |
| 2001 | Pelfrene et al. | Psychological Demands (9 items) Decision Latitude (9 items): Skill discretion (6) /Decision authority (3) Social support: Supervisors (4 items) Co-workers (4 items) Control: Timing (4 items); Methods (6 items) | Job satisfaction |
| 2001 | MacDonald et al. | Physical stressors Psychosocial stressors (30 items): Job strain/ Psychological demands/ Decision Latitude/ Mental work load/ Poor work schedule control/ Lack of group cohesion/ Group pressure/ Lack of supervisors support/ Lack of co-workers support/ Opinions non accepted by work group | Musculoskeletal Disorders |

| Year | Authors | Exogenous variables | Endogenous variables |
|------|----------------------------------|---|--|
| 2001 | Rafferty, Friend and Landsbergis | Demands (5 items) Control: Skill discretion (6 items)/Decision authority (3 items) Social Support: Supervisors, co-workers and others (4 items) | Emotional exhaustion Despersonalization Personal accomplishment |
| 2004 | Bakker, Demerouti and Verbeke | Job demands: Workload (Job Content instrument- 5 items); Emotional demands (4 items)/ work-home conflict (3 items) Job resources: Autonomy (Job Content instrument 3 items)/ Possibilities for professional development (3 items)/ Social Support (3 items) | Burnout-Exhaustion and Disengagement Performance |
| 2004 | Schaufeli and Bakker | Demands: Quantitative Demands or Work overload (5 items) / Qualitative Demands (5 items) Job resources: Performance feedback (3 items)/ Social Support (10 items)/ Supervisors coaching (12 items) | Burnout Engagement Turnover intention Health problems |
| 2007 | Martín et. al. | Cognitive Demands Control Rewards Social support | Salud laboral Satisfacción laboral/Percepción de estrés/ Percepción de fatiga/Baja médica/Accidentes laborales/Enfermedad) |
| 2007 | Martín, Salanova and Peiró | Job demands (7 items) Job resources (5 items) | Individual innovation |
| 2007 | Wong, DeSantics and Staudemayer | Amount of interdependency (the degree to wich one relies on others to accomplish one's work) Clarity of interdependency (the degree to wich an individual is certain about whom he or she is reliant on and for what purpose) Control ("buffer") (13 items) | Role stress (ambiguity/ Role conflict) |
| 2007 | Grönlund | Demand (2 items) Control (3 items) | Work-to-Family conflict |
| 2008 | Tucker et al. | Demand- cuantitative work overload (3 items) Control (3 items) | Affective strain Control Demand |

Source: Authors.

In the same line, there is no agreement to define the domains of the different dimensions. (1) With respect to the variable Demands of Work, some authors propose a single dimension, compared to others that provide different dimensions or focus on some of them when constructing the measuring scales, making us find distinctions such as Quantitative demands or overload (Sargent and Terry, 2000; Bakker, Demerouti and Verbeke, 2004, Schaufeli and Bakker, op. cit..) and Qualitative demands (Pelfrene et al., 2001; MacDonalds, Karasek, Punnett and Scharf, 2001, Schaufeli and Bakker, op. cit.; Bakker, Demerouti and Verbeke, op. cit.; Martin Luceño, Jaen, and Rubio, op. cit., Wall et al., 1996 and Wall, Jackson and Mullarkey, 1995), even in the latter demands, they differentiate between Cognitive demands and Emotional demands. (2) Regarding the Control variable, although the Karasek's original model is built with the skills and authority subdomains, other authors are only opting for indicators of authority. In this line, Wall et al. (1996) conclude that their model significantly improves by considering a more restricted domain of the control concept. (3) With respect to the Support variable, almost all works qualify the distinction between Co-workers support and the Supervisors support although some authors are also introducing a Non-work support (family, friends ...) (Sargent and Terry, 2000; Cabezas, 2000; Rafferty, Friend and Landsbergis, 2001).

With regard to how to address the indicators of emotional and intellectual demands of work, in some studies they appear as items on the variable Demands of work, while in others they are measuring the construct Control.

On the other hand, with respect to the definition of variables to explain the JDCS Model and its variants, it is found that validated questionnaires in the literature, such as the Job Content Questionnaire or the Job Stress Questionnaire, are being used in some studies; however, other authors are committed to ad hoc measures. Furthermore, another issue to

debate is the type of interaction to consider in order to analyse the relationship between Demands and Control-Support on the one hand, and its impact on stress or other outcome measures (Van Vegchel, Jonge, Landsbergis, 2005). In this regard, certain works (Arrow and Jones, Ganster and Fusilier's, cit. in Wall et al., 1996; Landsbergis, 1988; Rafferty, Friend and Landsbergis, 2001, Tucker et al., 2008) conclude that there is no evidence of the moderating effect posited by Karasek (1979), compared to other studies that do provide this evidence (Sargent and Terry, op. cit.; Van Vegchel, Jonge, Landsbergis, op. cit.).

Finally, certain works pose the introduction of control variables to improve the predictive capacity of the model. Thus, some studies should be highlighted: Landsbergis (1988), Karasek (1990), Wall, Jackson and Mullarkey (1995), Wall et al. (1996), Janssen (2000), McDonald et al. (2001), Grönlund (2007), Martin, Salanova and Peiro (2007) and Wong, DeSantics Staudemayer (2007) whereby we find positive and negative effects of variables such as sex, age and / or occupation in both psychosocial factors and outcome variables.

Explanatory Model of Mental Strain

After analysing in literature the various concepts of the psychosocial factors generating mental strain, and being based on the Andalusian Survey on Working Conditions, in this investigation it is necessary, first of all, to define the items of the target concepts (Demand, Control, Support and Mental strain) (Table 2) and, secondly, we will raise several alternative models capable of representing the network of relationships between these concepts and the control variables (Figure 1).

Table 2 Proposed indicators from previous studies

| QUANTITATIVE DEMAND (WORK OVERLOAD) | |
|--|--|
| 1. Undivided attention | Karasek, 1979; Wall et al., 1996; Pelfrene et al., 2001; Wall, Jackson and Mullarkey, 1995; Karasek, 1990; MacDonald, Karasek, Punnett and Scharf, 2001; ISTAS21; Job Content Questionnaire, Rafferty, Friend and Landsbergis, 2001 |
| 2. Requires working fast | Karasek, 1979; Pelfrene et al., 2001; Janssen, 2000; Schaufeli and Bakker, 2004; Bakker, Demerouti and Verbeke, 2004; MacDonald, Karasek, Punnett and Scharf, 2001; Job Stress Questionnaire; ISTAS21; Job Content Questionnaire, Rafferty, Friend and Landsbergis, 2001 |
| 3. Time pressure | Karasek, 1979; Pelfrene et al., 2001; Janssen, 2000; Schaufeli and Bakker, 2004; MacDonal et al., 2001; Cabezas, 2000; Job Stress Questionnaire; ISTAS21; Job Content Questionnaire, Rafferty, Friend and Landsbergis, 2001 |
| 4. Hard work | Karasek, 1979; Pelfrene et al., 2001; Wall et al., 1995; Grönlund, 2007; Schaufeli and Bakker, 2004; MacDonald et al., 2001; |
| 5. Not enough time | Karasek, 1979; Pelfrene et al., 2001; Grönlund, 2007; Janssen, 2000; Bakker, Demerouti and Verbeke, 2004; Martín et al., 2007; MacDonald et al., 2001; Job Stress Questionnaire; ISTAS21; Job Content Questionnaire, Rafferty, Friend and Landsbergis, 2001 |
| 6. Hectic job | Karasek, 1979; Pelfrene et al., 2001; Tucker et al., 2008; Janssen, 2000; Bakker, Demerouti and Verbeke, 2004; Martín et al., 2007; MacDonald, Karasek, Punnett and Scharf, 2001; Cabezas, 2000; ISTAS21; Job Content Questionnaire, Rafferty, Friend and Landsbergis, 2001 |
| CONTROL | |
| 1. Nonrepetitious work | Karasek, 1979; Pelfrene et al., 2001; MacDonald et al., 2001; ISTAS21; Job Content Questionnaire, Rafferty, Friend and Landsbergis, 2001 |
| 2. Task variety | Pelfrene et al., 2001; Wall et al., 1995; MacDonald et al., 2001; ISTAS21; Job Content Questionnaire, Rafferty, Friend and Landsbergis, 2001 |
| 3. Opportunity to do what you best do | Bakker, Demerouti and Verbeke, 2004; Karasek, 1990; MacDonald et al., 2001; Cabezas, 2000; ISTAS21; Job Content Questionnaire, Rafferty, Friend and Landsbergis, 2001 |
| 4. Creativity required | Karasek, 1979; Martín, Salanova y Peiró, 2007; Pelfrene et al., 2001; Bakker, Demerouti and Verbeke, 2004; Karasek, 1990; MacDonald et al., 2001; Cabezas, 2000; Job Stress Questionnaire; ISTAS21; Job Content Questionnaire, Rafferty, Friend and Landsbergis, 2001 |
| 5. Freedom to decide the order in which you do | Karasek, 1979; Martín, Salanova y Peiró, 2007; Sargent y Terry, 2000; Wall et al., 1996; Pelfrene et al., 2001; Wall, Jackson and Mullarkey, 1995; Wong, DeSantics Staudemayer, 2007; Grönlund, 2007; Bakker, Demerouti and Verbeke, 2004; Karasek, 1990; Martín et al., 2007; MacDonald et al., |

| | |
|---|---|
| things | 2001; ISTAS21; Job Content Questionnaire; Rafferty, Friend and Landsbergis, 2001 |
| 6. Freedom to choose your own method of working | Karasek, 1979; Martín, Salanova y Peiró, 2007; Sargent y Terry, 2000; Wall et al., 1996; Pelfrene et al., 2001; Wall, Jackson and Mullarkey, 1995; DeSantics Staudemayer, 2007; Grönlund, 2007; Bakker, Demerouti and Verbeke, 2004; Karasek, 1990; Martín et al., 2007; MacDonald et al., 2001; ISTAS21; Job Content Questionnaire; Rafferty, Friend and Landsbergis, 2001 |
| 7. Freedom to decide the pace of work | Karasek, 1979; Martín, Salanova y Peiró, 2007; Sargent y Terry, 2000; Wall et al., 1996; Pelfrene et al., 2001; Wall, Jackson and Mullarkey, 1995; DeSantics Staudemayer, 2007; Grönlund, 2007; Bakker, Demerouti and Verbeke, 2004; Karasek, 1990; Martín et al., 2007; MacDonald et al., 2001; ISTAS21; Job Content Questionnaire; Rafferty, Friend and Landsbergis, 2001 |
| 8. Freedom to choose or change the distribution / duration pauses | Karasek, 1979; Martín, Salanova y Peiró, 2007; Sargent y Terry, 2000; Wall et al., 1996; Pelfrene et al., 2001; Wall, Jackson and Mullarkey, 1995; DeSantics Staudemayer, 2007; Grönlund, 2007; Bakker, Demerouti and Verbeke, 2004; Karasek, 1990; Martín et al., 2007; MacDonald et al., 2001; ISTAS21; Job Content Questionnaire; Rafferty, Friend and Landsbergis, 2001 |
| SUPPORT | |
| 1. Co-worker support | Sargent y Terry, 2000; Pelfrene et al., 2001; Schaufeli and Bakker, 2004; Bakker, Demerouti and Verbeke, 2004; Martín et al., 2007; MacDonald et al., 2001; Cabezas, 2000; Job Stress Questionnaire; ISTAS21; Job Content Questionnaire; Rafferty, Friend and Landsbergis, 2001 |
| 2. Supervisor control | Sargent y Terry, 2000; Pelfrene et al., 2001; Schaufeli and Bakker, 2004; Martín et al., 2007; MacDonald et al., 2001; Cabezas, 2000; Job Stress Questionnaire; ISTAS21; Job Content Questionnaire; Rafferty, Friend and Landsbergis, 2001 |
| 3. Non-work support | Sargent y Terry, 2000; Cabezas, 2000; Rafferty, Friend and Landsbergis, 2001 |
| QUALITATIVE DEMAND-CONTROL | |
| 1. Intellectually demanding job | DEMAND: Wall, Jackson and Mullarkey, 1995; Karasek, 1990; Martín, Luceño, Jaen y Rubio, 2007; Cabezas, 2000; ISTAS21 |
| | CONTROL: Karasek, 1979; Pelfrene et al., 2001 |
| 2. Emotionally demanding job | DEMAND: Wall, Jackson and Mullarkey, 1995; Schaufeli and Bakker, 2004; Bakker, Demerouti and Verbeke, 2004; Karasek, 1990; Cabezas, 2000; ISTAS21 |
| | CONTROL: Karasek, 1979 (Control); Pelfrene et al., 2001 |

Source: Authors.

Regarding the construct Demands of work, 6 indicators are selected from the questionnaire: undivided attention, working fast, time pressure, hard work, not enough time, hectic job. These indicators are considered in most of the studies analysed, and all refer to the concept of work overload.

To construct the Control variable 8 questionnaire indicators are selected: nonrepetitious work, task variety, possibilities development, creativity required, freedom to decide the order in which you do things, freedom to choose your own method of working, freedom to decide the pace of work, freedom to decide or change the distribution / duration of pauses. These are the eight variables most frequently listed in the bibliography, however, the variables of creativity and responsibility for the decisions taken have not been taken into consideration as they are not present in the questionnaire. In parallel, the option is to consider two additional indicators: Intellectually demanding job and Emotionally demanding job, although, as a matter of fact, they were not associated to a specific factor: Qualitative demands or Control.

With respect to Social support 3 indicators are selected from the questionnaire: Co-workers support, supervisors control and non-work support. These indicators reflect the different types of support considered in the literature.

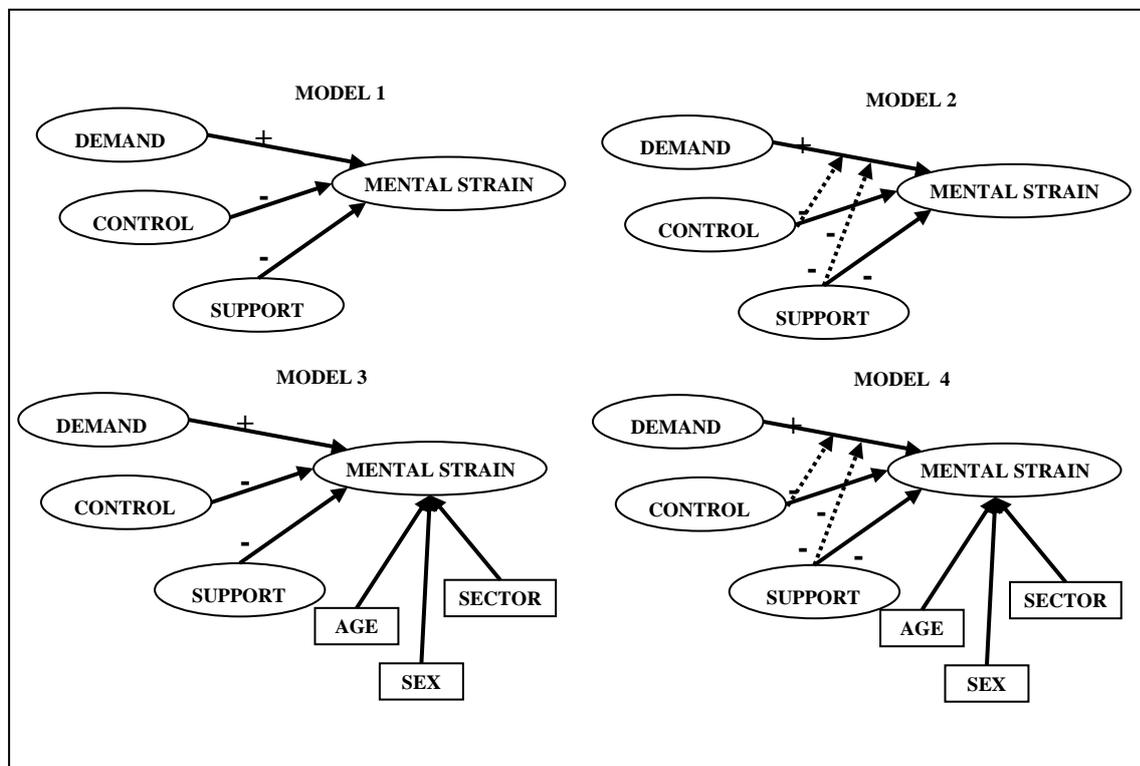
In this work, mental strain is operated through the following indicators: Risk Perception of having an illness caused by their work and Risk perception of having an accident. We chose these measures for two reasons: first because illness and accidents are potential effects of stress and, second, due to the value given to self-perception as an indicator of problems. As for their consideration as possible consequences of stress, many previous studies have associated them with it both in the field of behaviour and physiology. Thus, work stress is often seen as a risk factor for cardiovascular disease, musculoskeletal disorders,

depression and anxiety (Martin et al., 2007). Simultaneously, it has been shown that a stressed employee is more likely to neglect safety precautions, to take unnecessary risks or not to be aware of imminent danger (Quick et al., 1997, Martin et al., 2007).

On the other hand, Kleinman, Eisenberg and Good (1978) propose the indirect measurement of potential problems through self-perception of the worker, that is, measuring the concept of illness as a subjective feeling. Although the perception of health can be regarded as a less "scientific" and with less "validity" than the health status assessment conducted by a doctor, during the last decades different studies on perceived health have appeared to show us that perception of health is a reliable indicator of mortality and morbidity, of use of health services, early retirement, unemployment and / or sick leave. Therefore, the perception of health is considered a good indicator, easy to obtain and interpret (ISTAS, 2004). In addition, there are also previous studies that analyse the relationship between mental strain and low-rated self-perceived health (Pikhart et al., 2001).

In order to deepen the knowledge of the network of relationships among the concepts of the JDCS Model, and to predict mental strain, 4 competitive models are proposed (Figure 1). The first model includes the direct effects of the three dimensions of JDCS Model. In the second model, it is provided that, in addition to the direct effects, there are some moderating effects of the Control and the Support on the Demand. In the third model, the control variables Age, Sex and Activity Sector are included in the JDCS Model. And finally, the fourth model unites the second and third model, that is, it is postulated: the background of mental strain as the three constructs Demand-Control-Support, the moderating effects of the control variables Demand and Support on the perceived Demand; and the three control variables Age, Sector and Activity Sector are also included.

Figure 1. Competitive Models



Database, Analysis and Results

As described previously, the source of information basis of this analysis is the Andalusian Survey on Working Conditions 2008. First, we present the technical data of the study. Secondly, after analysing the dimensional structure of the concepts under analysis, the implicit models of the hypotheses are shown (Figure 1), and we end with the empirical justification of the main results obtained.

The population under analysis is the set of Andalusian workers who live in municipalities with more than 5,000 inhabitants. The sample is defined by a multistage stratified random sampling. Information collection is conducted through personal interviews in the homes of respondents. The final sample of 8275 interviews was performed in 139 Andalusian municipalities over 5000 inhabitants.

Given the multivariate analysis to be performed in this study, the treatment selected of missing data is listwise deletion. Thus, our matrix report consists of 7512 records, therefore one of the highlights of the empirical exercise that follows is the richness of information to work with. Note that the target variables (items of the concepts under analysis Demand-Control-Support and Mental strain) are measured from the Likert scale of 5 points, in all cases a lower score implies a lower level of the feature and a higher score is associated with an increased presence of the same.

Prior to the estimation of the proposed models, from the set of items defined in Table 2, we proceed to perform different principal component analysis, retaining three, four and up to seven components. After analysing both the commonalities and the percentage of variance explained as the loads (size and association), we chose to remove four items of the construct Demand, three of the construct Control and an item of the Construct Support, and 4 Mental strain components are retained instead of the usual three in the literature: Quantitative demands, Qualitative or psychological demands, Control and Support.

Thus, once the empirical exercise is conducted and the results are analysed, the methodology chosen for subsequent analysis is SEM (Structural Equations Models). SEM allows the researcher to introduce a priori information (accurately defining the latent variables according to their indicators and estimating them once obtained the given factor loadings) and to reformulate the models (obtaining higher-order structures that synthesize closely related dimensions). Moreover, in this methodological framework, the researcher can infer results according to the distribution of the observed variables (statistical corrections), and use interval variables even though their range of variation is 5 points.

So, from the mentioned structure it is necessary to conduct a Confirmatory Factorial Analysis with the 4 target constructs. As it can be seen from the results of Table 3 (Model 0), the statistical and overall fit indices of the model have values that suggest no rejection of it, although it is not accepting the null hypothesis associated with the chi-square Satorra -Bentler (the number of observations exceeds 7,000).

Table 4 indicates the estimates of model parameters. It should be noted that all estimated charges exceed the value of 0.7 and consequently, the reliability coefficients of observed variables (R^2) are greater than 0.5. Moreover, the values of the coefficients of reliability of the latent variables (CF1-reliability coefficient of Fornell and Larcker) provide evidence of convergent reliability and validity. Regarding discriminant validity, all factor

loadings are higher than the observed correlations among the dimensions (Bagozzi, 1980). Nomological or predictive validity of them is judged on the theoretical framework of the outlined models (Model 1 outcomes). So, in principle, there is sufficient evidence of construct validity.

Table 3. Summary of Statistical and Goodness of Fit Indices of Models.

| | g.l. | $\chi^{(S-B)}$ | R-RMSEA | SRMR | GFI | AGFI | R-BBN | R-CFI |
|-----------------|------|----------------|---------|-------|-------|-------|-------|-------|
| Model 0 | 29 | 478.15 | 0.045 | 0.022 | 0.983 | 0.968 | 0.986 | 0.987 |
| Model 1 | 44 | 716.35 | 0.045 | 0.022 | 0.981 | 0.966 | 0.983 | 0.984 |
| Model 2 | 72 | 972.48 | 0.041 | 0.019 | 0.983 | 0.967 | 0.971 | 0.973 |
| Model 3 | 79 | 1206.66 | 0,044 | 0,020 | 0,979 | 0,960 | 0,975 | 0,977 |
| Model 4 | 107 | 1434.77 | 0.041 | 0.019 | 0.981 | 0.959 | 0.976 | 0.969 |
| Model 2B | 58 | 817.74 | 0.042 | 0.020 | 0.982 | 0.968 | 0.977 | 0.979 |
| Model 3B | 47 | 888.53 | 0.049 | 0.023 | 0.979 | 0.960 | 0.977 | 0.978 |
| Model 4B | 60 | 964.58 | 0.045 | 0.021 | 0.981 | 0.962 | 0.971 | 0.973 |

The version B: significant effects.

So once we have found the underlying structure of the constructs in the database under analysis, we proceed to parameterize the different competitive models described in Figure 1. The moderating variables were calculated in two stages, first we estimated the latent variables (Model 0), and secondly the necessary multiplications were calculated, that is to say, the products are calculated between the Control and Support latent variables regarding the two types of Demand found. With regard to categorical variables, first, the variable Sex is dichotomized leaving the category of man as zero-based. Second, in relation to the Sector variable, it is the industry sector which is taken as zero-based.

Table 4. Model 0: Parameters and Reliability Coefficients

| ITEMS | QD | PD | CT | SP | R ^{2*} |
|--|-------------|-------------|-------------|-------------|-----------------|
| QD_1 Requires working fast | 0.86 | | | | 0.74 |
| QD_2 Time pressure | 0.72 | | | | 0.52 |
| PD_1 Intellectually demanding job | | 0.86 | | | 0.75 |
| PD_2 Emotionally demanding job | | 0.78 | | | 0.61 |
| CT_1 Freedom to decide the order in which you do things | | | 0.89 | | 0.79 |
| CT_2 Freedom to choose your own method of working | | | 0.87 | | 0.76 |
| CT_3 Freedom to decide the pace of work | | | 0.90 | | 0.82 |
| CT_4 Freedom to choose or change the distribution/duration pauses | | | 0.81 | | 0.65 |
| SP_1 Co-worker support | | | | 0.96 | 0.92 |
| SP_2 Supervisor control | | | | 0.68 | 0.46 |
| QD QUANTITATIVE DEMANDS | 0.77 | | | | |
| PD QUALITATIVE DEMANDS | 0.17 | 0.80 | | | |
| CT CONTROL | -0.03 | 0.37 | 0.81 | | |
| SP SUPPORT | 0.21 | 0.14 | 0.02 | 0.81 | |
| Fornell and Larcker Coefficients | 0.63 | 0.67 | 0.77 | 0.69 | |

Diagonal: Omega coefficients.

Table 3 summarizes all the indexes and statistical goodness of fit of all estimated models, both in its wide and low, that is, after removing the effect of variables that are not significant (version B of the models). Thus, by reading Table 3 it can be concluded that there was insufficient evidence to reject such models, although, as in the case of Model 0, the null

hypothesis of such representations cannot be accepted given the number of observations which are available.

The following describes the main results, model by model (Table 5 and Table 6). The first model, Model 1, postulates that the 4 latent variables are the background of Mental strain. The outcome order is in terms of their importance in the generation of Mental strain and it is: Quantitative Demand, first, followed by Support, Control and, finally, Qualitative Demand. It should be emphasised that the signs obtained are the expected. However, it is stated that the percentage of variance does not exceed 7%. Nevertheless, through this model the nomological validity of the contracts under analysis should be assessed positively.

Table 5. Results of the Structural Models.

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|----------------------|---------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | Beta | t-test | Beta | t-test | Beta | t-test | Beta | t-test |
| QD | 0.232 | 15.96 | 0.231 | 15.822 | 0.224 | 14.402 | 0.213 | 13.638 |
| PD | 0.037 | 2.46 | 0.033 | 2.242 | 0.012 | 0.758 | 0.008 | 0.475 |
| CT | -0.086 | -6.34 | -0.086 | -6.448 | -0.046 | -3.265 | -0.040 | -2.866 |
| SP | -0.112 | -7.87 | -0.105 | -7.823 | -0.077 | -5.250 | -0.069 | -4.829 |
| QD CT | | | -0.005 | -0.447 | | | 0.009 | 0.724 |
| QD SP | | | -0.012 | -0.964 | | | -0.043 | -3.262 |
| PDCT | | | 0.024 | 1.622 | | | -0.005 | -0.417 |
| PD*SP | | | -0.027 | -2.158 | | | -0.038 | -2.926 |
| AGE | | | | | 0.066 | 5.352 | 0.064 | 5.215 |
| S-FEM | | | | | -0.085 | -6.625 | -0.090 | -7.081 |
| SC-CON | | | | | 0.002 | 0.181 | 0.004 | 0.274 |
| SC-SER | | | | | -0.146 | -9.709 | -0.149 | -9.920 |
| SC-AGR | | | | | -0.018 | -1.382 | -0.015 | -1.119 |
| R² | 0.066 | | 0.066 | | 0.105 | | 0.104 | |

All parameters are standardized.

Table 6. Results of the Structural Models: Significant Effects.

| | Model 2B | | Model 3B | | Model 4B | |
|----------------------|---------------|---------------|---------------|----------------|---------------|----------------|
| | Beta | t-test | Beta | t-test | Beta | t-test |
| QD | 0.233 | 15.872 | 0.213 | 13.672 | 0.203 | 13.005 |
| PD | 0.035 | 2.290 | | | | |
| CT | -0.085 | -6.205 | -0.037 | -2.860 | -0.040 | -2.559 |
| SP | -0.109 | -7.648 | -0.061 | -4.421 | -0.032 | -4.798 |
| QD SP | | | | | -0.066 | -3.279 |
| PD*SP | -0.031 | -2.509 | | | -0.037 | -2.823 |
| AGE | | | 0.066 | 5.423 | 0.063 | 5.177 |
| S-FEM | | | -0.092 | -7.298 | -0.097 | -7.670 |
| SC-SER | | | -0.142 | -11.165 | -0.146 | -11.424 |
| R² | 0.067 | | 0.098 | | 0.098 | |

All parameters are standardized.

Model 2 considers, in addition to the four constructs, the potential moderating effect of both the Control and the Support on both types of Demand. We conclude that there is only a moderating effect of perceived Support on the Qualitative demand perceived by the subject. In addition, signs of the effects are the expected and the order of importance found in Model 1 is maintained. However, there is hardly an improvement over the variance explained (0.1%) over the previous model (Model 1). The resulting moderating effect evidences that even if the subject perceives an increase in Qualitative demand, if in addition he/she perceives Support, the effect (though weak) mitigates the Mental strain perceived by the subject.

In Model 3, after estimation, both the variables Sex and Sector (dummy variables) and the Age have significant effects. These are explained as follows: on the one hand, with increasing age of the subject the perceived Mental strain increases. On the other, when Mental strain is perceived by women is lower than that perceived by men, and finally, that only Service Sector workers perceived less Stress in relation to other workers in other sectors (Industry, Construction and Agriculture). These results show that when Mental strain is controlled by the described variables (Age, Sex and Sector) the effects of Quantitative Demand, Control and Support on it diminish. The most remarkable result of this model 3 with respect to the proposed theoretical model (Model JDCS) is that the effect of qualitative demand stops being significant, being the sole antecedents of Mental strain Quantitative Demand, Control and Support.

Finally, Model 4 shows that the results are practically coincident to those obtained in Models 2 and 3. Thus, the Qualitative Demand variable has no significant effect and preserves the structure of effects of the rest of variables. The only difference is the existence of two moderating effects: the Support perceived by moderating the effect of both Qualitative Demand and Quantitative Demand. This means that although there is no direct effect of Qualitative Demand on Mental strain perceived by the subject, there does exist an indirect effect moderated by this perceived Support. Here we must highlight that this model has assumed that Support moderated the perceptions of Demand (Figure 1), however there is also the interpretation that it is Qualitative Demand which may moderate the effect of the variable Support. In this case, it seems that more Support would mean less Mental strain, and the higher the Qualitative Demands required to the workers, if he perceives Support in turn, the lower their perception of Mental strain.

Table 6 indicates the estimates of the 3 models after elimination of non-significant variables and their corresponding R². So, after the above information and given Tables 3 and 6, finally, the model which predicts mental strain the better in the analysed sample and shows a greater parsimony is the Model 3.

Conclusions

This research shows evidence that colour the issues of debate in the literature. Moreover, the wealth of information from which we depart and the thoroughness of the analysis, produce conclusions from robust results.

It may be concluded that the results are consistent with the model Demand-Control-Support (JDCS) for the Andalusian population of workers. Thus, the Mental strain is explained by the Demand construct positive influence and the relationship in the opposite direction of the constructs Control and Support. That is, the greater the Demand required to the worker the greater Mental strain perceived, and greater Support and Control mean lower

Mental strain perceived. Moreover, given the existence of two distinct constructs, Control and Support, which may not be grouped into a higher order factor, there is no evidence to justify the alternative model of Demands-Resources for the purpose of explaining Mental strain, given the indicators considered in this study (Schaufeli and Bakker, 2004 Bakker et al. 2004 Cabezas, 2007 and Martin et al., 2007).

Regarding the measured dimension of psychosocial factors the results show strong evidence that the first factor accounts for the Demand dimension, understood as workload. This factor includes the items of Requires working fast and Not enough time. The observed relationships among indicators determined the non-inclusion of variables such as Undivided attention, Hectic jobs and Not enough time. This construct is one that has a greater effect on the Mental strain, corroborating the existence of a specific weight of this factor by itself as a stressor. All this would indicate that the main source of Mental strain harmful to workers can best be measured with variables related to workload and time pressure to do it, as opposed to others such as the more or less complexity or commitment the task may have or need.

The second dimension is defined by the indicators: "emotional and intellectual demands of work", which indicates a second dimension of the construct Demand, a dimension in its own, differentiated from the previous factor. This result supports the proposal by Schaufeli and Bakker, 2004, that is, two factors should be distinguished in Demand: Quantitative Demand (work overload) and Qualitative Demand (emotional and intellectual demands).

Obtaining the third variable Control over work corroborates the results of Wall et al. (1996), who suggest a narrower approach of the same, in line with the sub-dimension of Authority completed by Karasek (1979). This implies that the Control construct is best built with items relating to control over time, Pace, Methods and Order of the tasks, leaving out the variables related to: Nonrepetitious work, task variety, opportunity to do what you best do, creativity required.

The fourth factor, Support, is defined exclusively by the support of co-workers and supervisors together, as opposed to its extension to other social sources as suggested by other authors as Pelfrene et al. (2001). The influence of this construct on Mental strain corroborates the improvement of the initial model of Karasek (JDC Model), based on the inclusion of the buffering effects of social Support as he addresses it in subsequent studies (JDCS Model).

The hypothesis of the moderating effect of the constructs has been analysed in this paper under different approaches, concluding that the direct effect of the variables Control and Support over Mental strain is quite more important, unlike what was stated in other studies (Van Vegchel, N., Jonge, J., Landsbergis, P., 2005). Thus, only very weak moderating Support effects were found in the Quantitative and Qualitative Demand. These effects are too weak to substantially improve the percentage of variance of our variable Mental strain.

On the other hand, it is evident that the introduction of control variables improves the predictive capacity of the JDCS model. Contrary to what is normally found in other studies regarding the influence of the Sex variable on work stress, in our study we found that women perceive lower levels of stress. This may be due to the composition of the sample, which, as it has sought to be representative of sectors and sex, concentrates most of the women in the service sector, the sector which has lower levels of work stress. It would therefore be desirable to further progress in the study of how these variables influence stress. In line with

this approach, it is also shown that as age increases the risk increases too and staff working in the Services Sector showed less Mental strain than other workers.

Compared with other studies in the literature, empirical exercises performed in this research have both advantages and disadvantages. Among the advantages, the most notorious is the wealth of information available, in terms of records analysed. However, this advantage also has a downside, namely the definition of the domains of the constructs that have been analysed is conditioned by the base questionnaire used in the Andalusian Job Conditions Survey. On the other hand, this wealth of information has allowed us to accept the null hypothesis of the chi-square contrasts, but, at the same time, the power which does not evidence such acceptance has also allowed us to detect effects that other smaller samples had not possibly shown. Another advantage has to do with the selected methodology of Structural Equation with Latent Variables Models. A priori information could be introduced and its adequacy could be judged using robust statistical techniques, in line with the type of variables and their distribution. In addition, the calculation of the moderating effects was carried out by estimating the latent variables, and not simply through addition or average scales.

Finally, the wealth of information available and the results lead the authors of this paper to stand to continue this line of research. Thus, given the effect of control variables in the prediction of Mental strain, more specifically of Sex (female) and Sector (services), among the modeling options that can be taken, we will proceed to analyse both the base model as well as the moderating effects model in the different sub-samples defined by the mentioned variables. This will allow a deeper understanding of the JDSC Model as per specific groups.

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