

JOB STRESS IN INDUSTRIAL COMPANY: THE IMPACT OF GENDER, AGE AND SENIORITY ON TENSION LEVELS.

ESTRÉS LABORAL EN LA EMPRESA INDUSTRIAL: EL IMPACTO DEL GÉNERO, LA EDAD Y LA ANTIGÜEDAD EN LOS NIVELES DE Tensión.

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Abstract

Contemporary lifestyles are characterized by a multitude of factors that contribute to elevated levels of stress in the population, with work being a significant factor. This study addresses an important gap in social science research by examining work-related stress among industrial workers. The participating company was selected because it is emblematic in human resource management and psychosocial risk prevention. The Demands-Control-Support Questionnaire was used to determine the degree of job stress, and the socio-demographic variables of gender, age and seniority were also considered. The results showed that factory workers had minimal levels of job stress, with no differences between them and office workers. However, there was a significant discrepancy in job stress levels between men and women, with women having higher levels. Regarding age and seniority, job stress levels tend to decrease with increasing age and seniority.

Keywords: age, gender, Job Demand-Control-Social Support Model, job stress, Karasek, seniority, Spain.

Resumen

Los estilos de vida contemporáneos se caracterizan por una serie de factores que contribuyen a elevar los niveles de estrés en la población, siendo el trabajo un factor significativo. Este estudio aborda una importante laguna en la investigación en ciencias sociales al examinar el estrés laboral en trabajadores industriales. La empresa participante fue seleccionada por ser emblemática en la gestión de recursos humanos y la prevención de riesgos psicosociales. Para evaluar el nivel de estrés laboral se administró el Cuestionario de Demandas-Control-Apoyo, y se consideraron las variables sociodemográficas de género, edad y antigüedad. Los resultados revelaron que los trabajadores de fábrica presentaban niveles mínimos de estrés laboral, sin diferencias significativas en comparación con los trabajadores de oficina. Sin embargo, se observó una discrepancia significativa en los niveles de estrés laboral entre hombres y mujeres, siendo este último grupo el que presentaba niveles más elevados. En lo que respecta a la edad y la antigüedad, los niveles de estrés laboral tienden a disminuir.

Palabras clave: edad, género, Modelo Demanda de Trabajo-Control-Apoyo Social, estrés laboral, Karasek, antigüedad, España.

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1. INTRODUCTION

Stress is a prevalent social and health problem in contemporary societies, and some authors have designated it the 'epidemic of the 21st century' (Aguiló, 2019). Specifically, a study conducted by IPSOS states that in the year 2024, 33% of Spanish workers reported feeling stressed one or more times in the last year to the point of being unable to go to work for a period of time (IPSOS, 2024).

This research examines job stress in an industrial company, an area that has received less attention compared to other fields such as health or education. According to Azevedo et al. (2019), the sectors that have been the focus of the majority of research on job stress are the health sector (47%), the education sector (14%), and the military (10%). While there are numerous studies on job stress in general, there is a specific gap in the literature regarding job stress in industrial settings, particularly concerning the interaction between socio-demographic variables and stress levels in manufacturing environments. Most existing research has focused on service-oriented sectors like healthcare and education, with industrial workers remaining relatively understudied despite their unique workplace conditions and stressors. Our study addresses this gap by specifically examining how gender, age, and seniority influence stress levels in an industrial context, where physical demands often combine with organisational pressures in ways distinct from other sectors.

1.1. Job stress

The term 'job stress' encompasses diverse definitions shaped by general perspectives, facing the challenge of occasional imprecision and contradictions due to its inherent complexity (Akanji, 2013). Initially, it was described as 'a situation wherein job-related factors interact with the worker to change his or her psychological and/or physiological condition such that the person is forced to deviate from normal functioning' (Newman & Beehr, 1979:1). In contemporary terms, job stress is characterized as a pattern of physical and psychological responses to uncontrollable external work demands (Patlán, 2019). That is, it can be defined as the response a worker experiences to a specific situation in their work environment, both in the short and long term, manifesting itself as a result of that specific condition.

The absence of a comprehensive and global definition of work-related stress represents a significant obstacle that hinders the progress and development of research in this field of study (Gunasekara & Perera, 2023).

The European Agency for Safety and Health at Work (EU-OSHA, 2016) identifies stress as the second most prevalent health issue among European workers, adversely affecting organisations. This results in heightened staff turnover, increased absenteeism and presenteeism, more workplace accidents and sick leave, communication challenges, early retirements, reduced business performance, and substantial economic losses estimated in billions (Collins et al., 2018; Götz et al., 2018; Hassard et al., 2018; Kaur et al., 2017; Mäcken, 2019; Serafica et al., 2023). On the other hand, job stress can lead to various health problems, including blood pressure issues, muscle tension, and depression. It can also cause specific challenges such as decreased concentration, altered personality and work habits, low back pain, and the potential for burnout (Gavelin et al., 2022; McTernan et al., 2013; Yang et al., 2023).

Osorio & Cardeñas (2017) conducted a review highlighting three predominant explanatory models of job stress in research: the demand-control model (Karasek), the effort-reward imbalance model (Siegrist), and the transactional model (Lazarus &

Folkman). Karasek's (1979) model relates job strain to the interaction of job demands and decision/control freedom. The job demand dimension includes psychological stressors related to workload, unanticipated tasks, and conflicts with colleagues and superiors. In contrast, the job control dimension refers to an individual worker's potential ability to control their tasks and behaviour during the working day (Karasek, 1979).

Research has shown that there is a correlation between high job demands, low job control, and increased levels of stress and job dissatisfaction (Fila, 2016; Rigó et al., 2020). Johnson & Hall (1988) expanded the model by integrating the dimension of social support, emphasizing interactions and support from coworkers and supervisors. According to this model, workers facing high demands, low control, and insufficient social support are susceptible to job stress (Karasek & Theorell, 1990), with social support acting as a modulating variable (Chesley, 2014). Stressors are estimated using the Job Content Questionnaire (JCQ) (Karasek et al., 1998). This study adopted Karasek's model as its theoretical foundation due to its widespread use, recognition, and influence in the scientific field (Babamiri et al., 2022; Luchman & González-Morales, 2013; Taris, 2016). Its frequent application in comparison to other related models has contributed to the consolidation of its position as the most tested (Kain & Jex, 2010).

On the other hand, the model assesses dimensions that include aspects related to work relationships, one of the areas in which stress manifests itself. In particular, the dimension of social support stands out, which acts as a modulator of these levels.

For many years, studies have included socio-demographic variables as a crucial aspect of job stress assessment and management, acknowledging their significant impact on stress levels (Leka & Jain, 2010). Variables associated with stress response encompass age, gender, marital status, social class, geographical areas, personality, education, income, occupation, workplace, and seniority (Marinaccio et al., 2013; Novais et al., 2016).

1.2. Job stress and socio-demographic variables

This study explores the relationship between perceived job stress, following Karasek's model, and three of these variables: gender, age, and seniority. In the context of the socio-demographic variable of sex, extant literature suggests that women often experience higher job stress levels in comparison to men (Mensah, 2021; Solanki & Mandaviya, 2021; Wiegner et al., 2015). Numerous studies suggest that adult women are more susceptible to anxiety and stress disorders, with some reporting two to three times higher likelihood, particularly in the workplace (Christiansen, 2015). With the growing integration of women in the labour market, the analysis of the correlation between this variable and stress has acquired increasing importance (Fila et al., 2017).

The varying stress levels between genders are attributed to risk factors, with women reporting more stress sources, interpersonal stimuli, and a greater impact on their health (Ramos & Jordão, 2014; Richardsen et al., 2016). Additionally, anatomical differences in men and women's brains may contribute to diverse stress responses (Novais et al., 2016).

Regarding age, job stress is notably linked to younger workers globally (Harter, 2023; Parry et al., 2022). Research indicates that older workers are less affected by intense negative daily work situations, maintaining high attention levels and experiencing lower negative impacts on such days (Scheibe, 2021). Kushal et al. (2018) similarly

identify a negative correlation between age and the number of stress sources, job profile and stress, and work experience and stress. Younger employees often require substantial assistance with tasks upon joining a position, and their perception of and response to stress varies according to individual differences in self-regulation and personality traits (Nowak, 2023). Alternatively, older individuals have been shown to possess enhanced coping capacity, elevated internal locus of control, and more efficient coping strategies (Aldwin et al., 2021). Furthermore, they do not consider that work-related stress has a significant impact on their job performance (Lee et al., 2025).

Conversely, Rauschenbach & Hertel (2011) demonstrate an inverted U-shaped relationship between age and stress, supported by higher environmental demands on middle-aged workers. A literature review by Griffiths et al. (2009) concurs, indicating that workers aged 50-55 years experience the highest stress levels, which diminish as they approach retirement age. It is worth noting that older workers exhibit significant gender differences in their perception of work-related psychosocial factors and work-related injury outcomes (Baidwan et al., 2019).

Finally, the socio-demographic variable of seniority was shown to have a significant negative relationship with stress. That is, the longer the seniority, the lower the stress levels of workers (Azofeifa et al., 2016; Kushal et al., 2018). This phenomenon can be attributed, firstly, to a reduction in job demands (Hessels & van der Zwan, 2019) and, secondly, to an increase in effective coping strategies (Kruczek et al., 2020). Furthermore, Casu & Giaquinto (2018) concluded that job seniority is a moderating variable between entrapment and sources of job stress. Cardoso et al. (2018) proposed that new age management policies implemented by human resources departments represent the optimal approach to address the challenges posed by an ageing workforce.

Investigating the manifestation of job stress in manufacturing companies in the industrial sector is crucial due to limited research in this area. Additionally, it is essential to differentiate between the two main groups of workers in this business sector: direct workers (factory) and indirect workers (office). These groups may have different stress levels due to their completely different roles. It is also important to examine how socio-demographic variables influence these dynamics. Analysing these dimensions in detail can help develop effective strategies to manage and prevent stress in work environments, promoting both well-being and professional effectiveness.

The aim of the research is to analyse the level of stress perception among employees. To achieve this, the levels of occupational stress will be compared between two groups of workers (office workers and factory workers) in an organisation in the industrial sector. The relationship between stress and socio-demographic variables such as gender, age, and seniority will also be explored. Our research hypotheses were: (1) The factory group experiences higher levels of job stress compared to the office group. (2) Women have higher levels of job stress than men. (3) The variable 'age' has a negative relationship with stress levels. (4) Similarly, the variable 'seniority' is negatively associated with stress levels. These hypotheses, while previously examined in other sectors such as health care and education, have rarely been systematically tested in industrial manufacturing settings. By applying stress models applied to the industrial sector, this study aims to verify whether the gender, age and seniority-related stress patterns observed in service-oriented occupations are consistent in production-oriented workplaces, which have different working conditions, physical demands and organisational structures.

2. METHOD AND MATERIALS

In the initial phase of the study, an exploratory investigation was conducted to identify a leading industrial enterprise that has distinguished itself through exemplary human resources management and psychosocial risk prevention strategies.

The selected multinational company, located in the province of Zaragoza (Spain), is part of an industrial sub-sector of great importance and tradition, with a presence in the region for more than 30 years. For reasons of confidentiality, the name of the company remains anonymous. This company was selected because of its importance in the region, its size and the diversity of its functions. It should be noted that although the study is based on convenience sampling, the entire population of employees was informed about the research and informed consent was obtained from those who chose to participate. This contextual information about the study population is essential to understand the scope of the study and the representativeness of the results obtained.

In the second phase, after the selection of the company, the quantitative approach is chosen to test the hypotheses, as it is considered the most appropriate method to respond to the objectives of this research. This stage is divided into five sub-stages: (i) selection of the sample and collection of information, (ii) selection of the instrument, (iii) administration of the questionnaire, (iv) analysis of the data and, finally, (v) discussion and conclusions.

In the first sub-phase, the sample is carefully selected and essential information is collected from both the workers and the organisation. The sample was selected by probability sampling from the total population of the company, with a total of 340 participants, divided into two groups: the factory group, consisting of 252 workers (although 296 were initially registered), and the office group, consisting of 88 people. The sample selected represents 28.01% of the total study population.

In the second sub-phase, an instrument was selected to assess the risk of job strain among workers. The Job Content Questionnaire (JCQ-29) developed by Karasek (1979) and later extended by Johnson and Hall (1988) was chosen. The questionnaire assesses three dimensions associated with job strain, which comprise various job factors: (i) psychological demands: time pressure, workload, physical demands and job breaks; (ii) control: freedom in decisions and task content; and (iii) social support: peer and supervisor support (Boxall & Macky, 2014; Karasek et al., 1998). The JCQ-29 assesses levels of job strain by combining the three dimensions mentioned above, resulting in different categories of job types. In particular, the category known as *isostressful jobs* (high job demands, low job control and low social support) is considered to expose workers to a higher risk of psychological distress caused by job strain (Karasek and Theorell, 1990). This instrument is widely regarded as one of the most influential in explaining the effects of job stress, supported by significant scientific evidence (Fila et al., 2017; Osorio & Cárdenas, 2017; Spiegelare et al., 2015). Moreover, studies indicate that the test-retest reliability over a period of five years is satisfactory among employees whose job responsibilities and ergonomic exposures have remained consistent over time (d'Errico, 2008).

The questionnaire utilised in this study is a Spanish version developed by Escribà-Agüir et al. (2001) and derived from the book *'Ergonomía y psicología aplicada: Manual para la formación del especialista'* (Llaneza, 2009, pp. 475-477). As demonstrated by Escribà-Agüir et al. (2001), this version exhibits a factor structure comparable to the original version, as evidenced by the high intraclass correlation

coefficient for each of the three dimensions (0.83-0.87) and Cronbach's alpha (0.74-0.88). Furthermore, the three dimensions of the JCQ also exhibit similar reliability to that of the original American questionnaire, with Cronbach's alpha values above 0.90 for each of the dimensions. It consists of 29 items, each assessed using a Likert-type response scale ranging from 1 (strongly disagree) to 4 (strongly agree). The items are classified into three dimensions according to Karasek's model, resulting in three scores: psychological demands (items 10 to 18), control (items 1 to 9), and social support (items 19 to 29). The control dimension is further divided into the content category (items 1, 2, 3, 4, 7 and 9) and the decisions category (items 5, 6 and 8). The social support dimension is divided into the supervisor's category (items 19, 20, 21, 22 and 23) and the coworker's category (items 24, 25, 26, 27, 28 and 29). To correct the questionnaire, we summed the scores of the items in each dimension, excluding items 4, 12, 13, 14, 21, and 26. The scores for the psychological demand's variable can range from 5 to 20, for the control variable from 8 to 32, and for the social support variable from 9 to 36.

We also collected additional information, including workers' type of job, gender, age, and years of experience, to compare with stress levels. This information was classified as follows:

- Type of work: factory and office.
- Gender: women and men.
- Age: group 1 (20,35], group 2 (35,50 years] and group 3 (50-65]. Organisation for Economic Co-operation and Development [OECD] (2005) classification; young workers (18-35 years), middle-aged workers (36-50 years) and old workers (51 years and over).
- Seniority: group 1 (2,12], group 2 (12,22] and group 3 (22 to 32 years).

In the third sub-phase, corresponding to the administration of the questionnaire, the sample participants completed the questionnaire confidentially. The research process was carried out on site in small groups under the exclusive supervision of one of the researchers. Subsequently, we analysed the collected data to determine the presence of stress in various sociodemographic groups, including factory/office, male/female, and age and seniority categories.

The theoretical framework posits that a worker will experience job strain when the scores on the control and social support dimensions are low and the scores on the job demands dimension are high. In the fourth sub-phase, the JCQ-29 was employed to identify significant levels of job strain. As there is no consensus regarding the definition of these levels in the questionnaire, it was necessary to identify an appropriate scale. In order to determine whether the mean or the median should be employed, the coefficient of variation was calculated. As the coefficient was found to be below 0.5 in all cases, it was concluded that the arithmetic mean is a representative measure of the research data. Consequently, the mean values of the total score in each of the dimensions were calculated (total control score: 32; total job demands score: 20; total social support score: 36).

The stress levels were considered significant if the scores were equal to or less than 16 for the control dimension, equal to or greater than 10 for the job demands dimension, and equal to or less than 18 for the social support dimension. Furthermore, to test Hypotheses 1 and 2, a test of equality of proportions was carried out with a confidence level of 95%. In contrast, to analyse Hypotheses 3 and 4 (age and

seniority), an analysis of covariance was conducted between these variables and the values of each of the dimensions of the model.

3. RESULTS

The sample (N=340) comprises 42.35% women and 56.47% men, with four blank values for this variable (1.18%). The age variable is dominated by Group 2 (35,50], constituting 65.88%, followed by Group 3 (50,65], representing 20%, and finally, Group 1 (20,35], representing 14.12%. In terms of seniority, the largest cohort is group 2 (12,22] (48.24%), followed by group 1 (2,12] (28.23%) and finally group 3 (22,32] (23.53%).

After dividing the sample into the study groups (see Table 1), the factory group showed an equal gender distribution, with 50% men and 50% women (four people did not provide this information). The mean age of the workers in this group was 41.78 years and the mean length of service in the company was 15.68 years. On the other hand, the office group was made up of 77.3% men and 22.7% women, with a mean age of 45.59 years and a mean length of service of 18.70 years. The disparity in participation between men and women in this group is explained by the fact that the majority of workers in this group are dedicated to a predominantly male activity, engineering.

Table 1. Socio-demographic variables of the research, separated according to study groups.

	FACTORY				OFFICE		
	Frequency	%	Mean		Frequency	%	Mean
GENDER				GENDER			
Female	20	22.73%		Female	124	49.21%	
Male	68	77.27%		Male	124	49.21%	
				Blank	4	1.58%	
AGE			45.59	AGE			41.78
Group 1 (20,35]	12	13.64%		Group 1 (20,35]	36	14.28%	
Group 2 (35,50]	44	50.00%		Group 2 (35,50]	180	71.44%	
Group 3 (50,65]	32	36.36%		Group 3 (50,65]	36	14.28%	
SENIORITY			18.70	SENIORITY			15.68
Group 1 (2,12]	28	31.82%		Group 1 (2,12]	68	26.99%	
Group 2 (12,22]	20	22.73%		Group 2 (12,22]	144	57.14%	
Group 3 (22,32]	40	45.45%		Group 3 (22,32]	40	15.87%	

Source: Own elaboration

Table 2 shows the results for each dimension. In the factory group, the mean of the control dimension is 17.3, which means that exceeding the threshold of 16 would not be a risk factor. The mean of the job demands dimension is 12.81, which is above

10 and represents a risk variable when associated with a low level of the control dimension. The mean of the support variable is 22.25, which is above 18, and denotes a positive modulating variable for stress. On the other hand, in the office group, the mean of the control dimension is 25.64, the mean of the job demand dimension is 15.27, and the mean of the support variable is 25.27.

The data indicate that none of the groups are experiencing high levels of stress, as they do not meet the three conditions required to be considered as experiencing job strain (low control, high job demands and low social support).

Table 2. Variables of the JCQ Questionnaire.

	FACTORY			OFFICE		
	CONTROL	DEMANDS	SUPPORT	CONTROL	DEMANDS	SUPPORT
N	252			88		
Mean	17.3	12.81	22.25	25.64	15.27	25.27
Median	17	13	22	26	15	26
Mode	18	12	21	26	14	26
Standard deviation	4.39	2.29	3.87	2.19	1.61	3.24
Variance	19.28	5.22	14.97	4.81	2.59	10.49
Range	22	10	19	8	5	13
Minimum Value	8	8	14	22	13	19
Maximum Value	30	18	33	30	18	32

Source: Own elaboration based on employee questionnaire (11 September 2023).

Although both groups have elevated levels of the job demands dimension, they also have high levels of control and support variables. According to Karasek’s (1979) categorisation, employees with high levels in the dimensions of demands and control are classified as belonging to the ‘active work’ group. These working conditions promote motivation and the development of new skills, and are associated with high levels of job satisfaction and reduced levels of work-related depression. It is important to note that the office group scored higher on all three dimensions, particularly on the control dimension (factory group=17; office group=26). Despite the fact that the workers as a collective do not evince elevated levels of work-related stress, a total of 32 workers demonstrated elevated levels. The scores obtained in the questionnaire by these workers are displayed in Table 3.

Table 3. Contingency table: distribution of cases of work-related stress by work environment.

Workers	Demands	Control	Support
A	11	9	18
B	12	11	14
C	13	12	17
D	13	16	18
E	15	14	18
F	13	14	15
G	11	12	17

Workers	Demands	Control	Support
H	16	15	18
I	12	12	17
J	11	12	18
K	11	9	18
L	12	11	14
M	13	16	18
N	15	14	18
Ñ	13	14	15
O	16	15	18
P	12	13	16
Q	12	11	14
R	11	10	18
S	13	16	18
T	16	15	18
U	13	14	15
V	15	14	17
W	12	12	18
X	16	15	18
Y	11	12	18
Z	13	14	15
AA	15	14	18
AB	18	12	17
AC	14	9	18
AD	13	16	18
AE	12	11	15

Source: Own elaboration based on employee questionnaire (11 September 2023).

Furthermore, workers who met the criteria associated with levels of job strain (control ≤ 16 ; demands ≥ 10 ; social support ≤ 18) were selected and a test of equality of proportions was conducted to examine hypothesis 1 (see Table 4), which aimed to determine whether the factory group had higher levels of job stress than the office group. The test was conducted with a sample of 340 individuals at a 95% confidence level. The analysis showed no significant difference in job stress levels between the factory and office groups ($p = 0.1096$).

Table 4. Contingency table: distribution of cases of work-related stress by work environment.

		JOB STRESS		
		Yes	No	Total
Work place	Factory	27	225	252
	Office	5	83	88
	Total	32	308	340

Source: Own elaboration based on employee questionnaire (11 September 2023).

Table 5 presents the relationship between the dimensions of the JCQ questionnaire and the socio-demographic variables in the study, categorized into factory and office groups. In the female cohort of the factory group, the control variable is less than 16 (15.8) and the demands are greater than 10 (12.6), indicating potentially high levels of stress. However, as reported in previous studies (Gillman et al., 2023; Nahum-Shani & Bamberger, 2011), the moderating variable of social support (21.06) alleviates these levels.

Table 5. The relationship between the dimensions of the JCQ Questionnaire and the variables sociodemographic.

		CONTROL	DEMANDS	SUPPORT
FACTORY	WOMEN	15.81	12.65	21.06
	MEN	18.77	13.03	23.35
	AGE 1	17.2	12.4	21.2
	AGE 2	17.07	13.09	21.56
	AGE 3	19.44	12.22	26.56
	SENIORITY 1	17.47	12.65	23.35
	SENIORITY 2	16.08	13.11	20.61
	SENIORITY 3	21.4	12	26.3
OFFICE	WOMEN	25	16	26
	MEN	25.82	15.06	25.06
	AGE 1	26	17	29
	AGE 2	25.18	15.45	25
	AGE 3	26.25	14.5	25.5
	SENIORITY 1	24.71	15.57	24.71
	SENIORITY 2	26.25	16	23.5
	SENIORITY 3	26	14.82	26.27

Source: Own elaboration based on employee questionnaire (11 September 2023).

A test of equality of proportions was conducted to examine hypothesis 2, which suggests that the socio-demographic variable ‘female’ is linked to higher levels of job stress than the variable ‘male’ (see Table 6). The sample size was 336 (comprising of factory and office groups), as four participants did not respond to this information. A confidence level of 95% was used. The analysis revealed significant differences, indicating higher stress levels for women in general ($p \approx 1$).

Table 6. Contingency table: distribution of cases of work-related stress by work environment.

		JOB STRESS		
		Yes	No	Total
Sex	Women	28	116	144
	Men	4	188	192
	Total	32	304	336

Source: Own elaboration based on employee questionnaire (11 September 2023).

In relation to the socio-demographic variables of age and seniority, a covariance study was carried out to determine whether there is a direct or inverse relationship

with each of the dimensions of the model. As can be seen in Table 7, there is a clear direct relationship between age and seniority and the dimensions of control and social support. The values of these two dimensions increase with increasing age and seniority. In contrast, there is an inverse relationship between age and seniority and the job demands dimension. As age and seniority increase, the value of the dimension decreases. This indicates that the factors that contribute to higher levels of job stress decrease as the age of the workers and the number of years in the company increase.

Table 7. Covariance between age and seniority, and the dimensions of the JCQ questionnaire.

		AGE	SENIORITY
FACTORY	Control	6.92	6.84
	Demands	- 0.70	- 1.37
	Support	7.27	5.18
OFFICE	Control	1.16	7.60
	Demands	- 7.59	- 4.32
	Support	1.12	7.04
WOMEN	Control	- 9.98	- 12.68
	Demands	- 4.41	- 6.06
	Support	- 6.57	- 10.57
MEN	Control	22.31	20.26
	Demands	1.88	1.43
	Support	15.29	16.00

Source: Own elaboration based on employee questionnaire (11 September 2023).

Subsequently, an analysis of covariance (ANCOVA) was performed in order to examine the impact of the independent variables (work environment, gender, age and seniority of employees) on the dependent variable, the level of job stress. The regression model (Table 8) shows a multiple correlation coefficient of 0.324, indicating a moderately low relationship between the independent variables and cases of job stress. The coefficient of determination R^2 is 0.105, suggesting that approximately 10.5% of the variability in job stress can be explained by the variables considered in the model. The adjusted R^2 is slightly lower (0.094), indicating that some of the variables may not be contributing significantly to the explanation of this variability.

Table 8. Covariance between age and seniority, and the dimensions of the JCQ questionnaire.

Regression statistics	
Multiple correlation coefficient	0,323896
Coefficient of determination R^2	0,104909
R^2 adjusted	0,094092
Standard error	0,279809

Source: Own elaboration (14 December 2023).

The analysis of variance (ANOVA) demonstrates that the model is statistically significant ($F= 9.699$, $p < 0.001$), accounting for approximately 9.9% of the variance in the stress cases (see Table 9). This finding indicates that at least one

of the independent variables has a significant impact on the employees' level of job stress. The examination of the individual coefficients discloses that gender exerts a significant and positive effect ($\beta = 0.162882$, $p < 0.001$), while the work environment demonstrates a significant negative relationship ($\beta = -0.084$, $p = 0.023$). The analysis indicates that age does not demonstrate a significant effect ($\beta = -0.001$, $p = 0.549$), and seniority exhibits a marginally significant positive relationship ($\beta = 0.003$, $p = 0.277$). These findings indicate that, when the independent variables of age and seniority are controlled for, gender and work environment emerge as the primary factors influencing stress levels. Specifically, it is observed that women report higher levels of stress, while lower levels of stress are reported in more favourable work environments.

Table 9. Covariance between age and seniority, and the dimensions of the JCQ questionnaire.

	Coefficient	p
Interception	0,073215	0,476669
Work place	-0,084364	0,023018
Sex	0,162882	0,0000018
Age	-0,001754	0,549473
Seniority	0,003016	0,277097

Source: Own elaboration (14 December 2023).

4. DISCUSSION

Concern about psychosocial risks at work, including job stress, is not a novelty, but it has been worrying scholars for years, but nowadays more attention is being paid to them, encouraging companies to assess and contain them (Macías, 2019; Moreno, 2014). A study conducted by Miranda & Gonçalves revealed that psychosocial factors have been identified as the most significant risk factors for workers (Miranda & Gonçalves, 2024). In addition, levels of job stress have shown a consistent upward trend over time, exacerbated in recent years by the COVID-19 pandemic crisis (Cigna, 2020). This escalation is particularly pronounced among workers in disadvantaged occupations, as observed by Rigó et al. (2020).

4.1. Levels of job stress

After analysing the stress levels derived from the JCQ questionnaire, it can be concluded that there are no high stress levels in the studied groups (factory group and office group) of the organisation. Neither group meets the criteria considered to be at risk [low control (≤ 16), high demands (≥ 10) and low social support (≤ 18)], indicating an adequate balance between the dimensions of the JDCS model. The values obtained (Factory: control (17.3), demands (12.81) and social support (22.25); Office: control (25.64), demands (15.27) and social support (25.27)) suggest that the control and social support variables moderate the high level of the demands variable. However, a subgroup of 32 workers was identified as having elevated levels of stress, predominantly comprising women in the factory group. However, the analysis of proportions revealed no statistically significant differences in stress levels between the factory and office groups ($p = 0.1096$).

These findings corroborate earlier research indicating that elevated levels of control and social support can serve as mitigating factors against high demands and are associated with enhanced workers' well-being (Fila, 2016; Rodwell et al., 2011). Additionally, it is noteworthy that in developed countries, the quality of social relationships constitutes the vast majority of sources of chronic stress (Wilkinson & Pickett, 2013).

The results obtained (absence of stress in both factory and office groups) contrast with other research, which suggests that both factory and office workers experience significant job stress, but differ in the sources of stress. For Bolliger et al. (2022), office workers tend to face high work intensity, time pressure and social environmental stressors. In contrast, factory workers, particularly those engaged in metalworking, are more likely to experience physical and psychological stress, as well as high oxidative stress (Tatzber et al., 2022). Other research indicates that stressors specific to office workers include performance appraisal and accountability for business results (Shin & Son, 2015); while job insecurity, low wages, heavy workloads and long working hours are common sources of stress for workers in general (Tausig & Fenwick, 2011).

4.2. Implications of the theoretical model

The demand-control-support model (DCS) has been extensively employed to identify job factors associated with job stress (Nordhall et al., 2024; Rodwell et al., 2011) and has been demonstrated to exhibit a satisfactory level of applicability (Shi et al., 2010).

Although there is no extensive current literature on job stress among employees in industrial companies (Yan et al., 2022), other research can be found that uses Karasek's demand-control-support model, together with the JCQ questionnaire, to study job stress in industry (Adjobimey et al., 2022; Alias et al., 2022; Juster et al., 2013). On the other hand, there are also studies that use other theoretical reference models to assess job stress, such as Lazarus & Folkman's transactional model of stress (Kaveh et al., 2023; Marrero et al., 2013) and Siegrist's effort-reward imbalance model (Siegrist & Li, 2017; Wang et al., 2020). Moreover, research has identified instances where more than one model has been employed, as evidenced by the study conducted by Inoue et al. (2013), which draws upon the demand-control-support (DCS) model and the effort-reward imbalance (ERI) model.

Although the model has been used in numerous studies to assess levels of job stress, it has also been criticised for a number of reasons. Firstly, the model's reliance on self-reports has been questioned, as well as the variability in the measurement of demand, control and support variables. In addition, the model has been found to have inadequate specification and operationalisation of the independent variables (Fila, 2016). The model has also been criticised for its application in cross-sectional designs. Montero et al. (2013) argue that the primary criticisms relate to the dimensionality of the scales employed to assess the Job Demands factor, as well as the consistency of the interactions between the variables.

The necessity for additional investigation into the JDCS model and the JCQ questionnaire is underscored, as emphasized by Shi et al. (2010). Expanding earlier suggestions, there is a need for adopting longitudinal designs, combining objective and subjective measures, using larger sample sizes, and giving more attention to diverse types of demands and control., there is a need for adopting longitudinal designs, combining objective and subjective measures, using larger sample sizes, and giving more attention to diverse types of demands and control.

This holistic approach should also encompass individual variables, as highlighted in studies by Fila (2017) and Luchman & González-Morales (2013).

4.3. Job stress by socio-demographic variables

Despite the absence of significant differences in job stress between the analysed environments, and the company's exemplary status in the prevention of occupational hazards, the proportions analysis result of the study indicates that there are discrepancies between the levels of work stress experienced by men and women, with higher stress experienced by women ($p \approx 1$).

This result is consistent with research by Colin-Chevalier et al. (2022), who conclude that women perceive higher levels of job demands and lower levels of social support, and Mensah (2021), who conclude that job stress has a direct and negative relationship with well-being and that women have a greater effect. A number of potential explanations for these findings can be proposed. One such explanation is that women may be reporting higher workloads and emotional experiences (Hagqvist et al., 2020), which could result in lower levels of control and social support factors (Marinaccio et al., 2013).

A review of the literature by Singh (2023) also indicates that women report higher levels of job stress. Nevertheless, they also observe that other studies have failed to identify significant differences between the sexes. An example of the latter is research by Cottingham et al. (2020) and Makhbul & Hasun (2011), which has demonstrated that there are no statistically significant differences between men and women in job stress levels. Ramos and Jordão (2014) also conclude in their research that there are no significant gender differences in job stress levels. Nevertheless, the study demonstrated that men exhibited a significantly lower prevalence of risk factors and a greater degree of organisational involvement compared to women. Conversely, some studies have indicated that men experience higher levels of job stress than women (Kushal et al., 2018). This discrepancy has been attributed to greater job demands, particularly greater work-related pressures (Rodríguez et al., 2001).

Research on job stress in industrial workers indicates that both men and women experience high levels of stress, although the sources and levels of stress may differ. For instance, the findings of Rivera-Torres et al. (2013) suggest that for men, only the quantitative demand dimension is statistically significant in relation to job stress, whereas for women, the qualitative demands (emotional and intellectual aspects) are also statistically significant.

Regarding the age of the workers, the study indicates a direct correlation with the variables of control and support, and an inverse correlation with the demands variable in the two groups analysed (Factory: control (6.92), demands (-0.70) and support (7.27); Office: control (1.16), demands (-7.59) and support (1.12)). These results support those obtained by Marinaccio et al. (2013), but contradict those proposed by Rodríguez et al. (2001), who suggested a direct correlation between age and demands and an inverse correlation with social support. Research indicates that the prevalence of job stress varies by age in the industrial sector. A review of the literature indicates that the prevalence of job stress varies by age in the industrial sector. Chitharaj et al. (2016) found that the 30-39 age group had the highest likelihood of experiencing stress, particularly psychological stress. Maqsoom et al. (2020) identified the influence of age and industrial experience on extrinsic psychosocial stressors. Their findings indicated that younger workers are more susceptible to work environment stressors, while less experienced workers are more vulnerable to

environment stressors. Yaldiz et al. (2018) emphasised the influence of age on the relationship between job resources and perceived stress. Their findings indicated that older workers were more likely to experience stress when resources were limited. In addition, Mauno et al. (2019) posited that older employees may experience greater work intensification and intensified learning demands, which may contribute to job stress.

Finally, in line with the findings related to the age variable, the seniority of workers in the organisation demonstrates a direct correlation with the control and support variables, and an inverse correlation with the demands variable in the two groups analysed (Factory: control (6.84), demands (-1.37) and support (5.18); Office: control (7.60), demands (-4.32) and support (7.04)). In the study conducted by Boxall & Macky (2014), it was established that seniority, when considered as a socio-demographic variable, was found to have a significant impact on job stress. No research has been found that relates seniority of workers in the industrial sector to job stress. In relation to other sectors, the research conducted, like Marinaccio et al. (2013), shows a direct relationship between the control variable and the support variable, while an inverse relationship is observed for seniority and demands. In contrast, Colin-Chevalier et al. (2022) discovered a direct association between job demands and job stress, coupled with an inverse relationship between social support and job stress. Research has identified that employees with over 10 years of seniority are at an increased risk of job stress, which is consistent with findings by Birze et al. (2023) and Chen & Cunradi (2008). Bradley's (2007) research suggests that the impact of job stress diminishes with seniority, which is interesting. However, Rogozińska-Pawelczyk (2018) study revealed that employees with the shortest and longest tenures tend to experience lower stress levels, while those with 6-15 years of employment report higher stress and lower satisfaction. Arji et al. (2023), also found that workers with less than 10 years of seniority were more stressed at work. In contrast, a study by Goh et al. (2021) found that employees with varying levels of experience were more susceptible to stress and anxiety episodes.

After statistical analysis, it is concluded that the selected socio-demographic variables explain a small proportion of the variance in job stress ($R^2 = 0.105$), with gender ($\beta = 0.16$, $p < 0.001$) and work environment ($\beta = -0.08$, $p = 0.023$) being the main predictors of stress. This result suggests the presence of other potentially relevant variables that were not taken into account. To improve the model and better understand the factors influencing job stress, it is recommended to incorporate other explanatory variables and investigate possible interactions between them.

The research has limitations that may affect the obtained results. Firstly, it was a cross-sectional study that was not followed up over time to determine if the results had changed. Additionally, work variables associated with stress, such as contract type, job flexibility, or insecurities, were not considered in the study (McGann et al., 2016). The study did not consider the impact of non-job stress on job stress, as personal life and job stress can have a reciprocal relationship (Abendroth & Den Dulk, 2011). Furthermore, it is important to consider the possibility that participants may not have been entirely truthful when completing the questionnaire.

It is also important to note that the socio-demographic variables of age and seniority are related to stress, as previously mentioned, provided that the working conditions have remained consistent over the past few years.

5. CONCLUSIONS

The present research, conducted within an industrial organisation, did not identify elevated levels of job stress among the factory and office groups. However, a subgroup analysis revealed that female factory employees exhibited higher stress levels, indicating substantial disparities between men and women. Our contribution in this area is significant in that it demonstrates the existence of differences between men and women, observing that neither social support nor control over one's own work neutralises this difference. While previous research has indeed identified gender differences in job stress across various sectors, our study makes a distinct contribution by demonstrating that these gender disparities persist specifically in industrial environments despite the presence of factors that typically moderate stress (control and social support). This is particularly noteworthy as industrial settings have traditionally been male-dominated and less studied from a gender perspective. Our findings confirm that even in workplaces with generally low stress levels and strong organisational support systems, women experience significantly higher stress levels than their male counterparts, suggesting that gender-specific stress factors operate independently of workplace interventions that are effective for the general workforce.

This opens up new lines of research in the exploration of the relationship between gender and exposure to related stress factors, as well as in the differentiated analysis of the role of both gender and sex in the experience and management of job stress.

Furthermore, age and seniority were found to be positively associated with control and social support, and negatively associated with demands. This suggests a possible relationship between work experience and a more favourable perception of the work environment. However, socio-demographic variables explained only a limited part of the observed variability in stress levels, with gender and work environment being the main predictors.

The discrepancy between our results and those of other studies can be attributed to the fact that the participating organisation may have an effective occupational risk prevention system, which has the effect of reducing the job stress values observed in another research. It would be beneficial to know the particularities of the company's occupational health and safety (OHS) system to facilitate the generalisation of the results to similar organisations.

It would also be advisable to ascertain the manner in which the participants were recruited by the company, namely the method by which the company selects personnel. It has been demonstrated that selecting workers by assessing personality and locus of control can reduce the levels of job stress within the company, as it acts as a protective factor.

With the data obtained, it would be interesting to look more closely at the measures taken by the company studied, with a view to generalising to other companies in the sector, as the main causal factor to intervene in to prevent stress is organisational. Additionally, it is recommended to place greater emphasis on socio-demographic variables when managing job stress. This focus on socio-demographic variables highlights the necessity of a comprehensive understanding of the multifaceted nature of job stress and its impact on individuals within the organisational context.

Authors contributions

The following sections outline the responsibilities of the various contributors to the project: *Concept and design*: Ester Bazco Nogueras, Victoria Sanagustín-Fons;

Methodology: Ester Bazco Nogueras and David Almorza Goma; *Software:* Ester Bazco Nogueras and David Almorza Gomar; *Data collection:* Ester Bazco Nogueras; *Analysis and interpretation:* Ester Bazco Nogueras, Victoria Sanagustín-Fons; *Preparation of the original draft:* Ester Bazco Nogueras; *Proofreading and editing:* Ester Bazco Nogueras and Victoria Sanagustín-Fons.

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Conflict of interest and Ethical clearance statement

The authors declare, in full disclosure and in accordance with ethical standards, that they have no competing interests, financial or otherwise, that could influence or bias the objective presentation and interpretation of the results of this article.

All study participants gave informed consent to participate in the research. Participants were informed of their right to withdraw from the study at any time. To ensure anonymity, each participant was assigned a unique identification number.

Availability of deposited data

In the course of this research, private data was collected and obtained following the signing of a confidentiality agreement with the collaborating organisation. This limitation on data disclosure is attributed to corporate policies, in response to the competitive nature of the organisation’s sector. In the event that a researcher expresses interest in the methodology employed for data analysis, they are encouraged to communicate with the corresponding author. The latter would be responsible for evaluating the request, taking as a reference the confidentiality agreement previously established with the organisation.

Declaration of AI use

The present research has employed a variety of artificial intelligence tools. On the one hand, Elicit was used to support the bibliographic review. Conversely, Chat GPT has been employed to enhance the readability and idiomatic quality of the text, with ongoing supervision and rigorous verification by researchers.

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Annex A

INSTRUCCIONES: Las siguientes afirmaciones corresponden a diversos aspectos relacionados con su puesto de trabajo y su entorno laboral. Deberá marcar, con una X, una sola casilla por afirmación, según el grado de coincidencia con ella.

1. Mi trabajo requiere que aprenda cosas nuevas.
☐ Totalmente en desacuerdo.
☐ En desacuerdo
☐ De acuerdo
☐ Completamente de acuerdo.
2. Mi trabajo necesita un nivel elevado de calificación.
☐ Totalmente en desacuerdo.
☐ En desacuerdo.
☐ De acuerdo.
☐ Completamente de acuerdo.
3. En mi trabajo debo ser creativo.
☐ Totalmente en desacuerdo.
☐ En desacuerdo.
☐ De acuerdo.
☐ Completamente de acuerdo.
4. Mi trabajo consiste en hacer siempre lo mismo.
☐ Totalmente en desacuerdo.
☐ En desacuerdo.
☐ De acuerdo.
☐ Completamente de acuerdo.
5. Tengo libertad de decidir cómo hacer mi trabajo.
☐ Totalmente en desacuerdo.
☐ En desacuerdo.
☐ De acuerdo.
☐ Completamente de acuerdo.
6. Mi trabajo me permite tomar decisiones en forma autónoma.
☐ Totalmente en desacuerdo.
☐ En desacuerdo.
☐ De acuerdo.
☐ Completamente de acuerdo.
7. En el trabajo tengo la oportunidad de hacer cosas diferentes.
☐ Totalmente en desacuerdo.
☐ En desacuerdo.
☐ De acuerdo.
☐ Completamente de acuerdo.

8. Tengo influencia sobre como ocurren las cosas en mi trabajo.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
9. En el trabajo tengo la posibilidad de desarrollar mis habilidades personales.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
10. Mi trabajo exige hacerlo rápidamente.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
11. Mi trabajo exige un gran esfuerzo mental.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
12. En mi trabajo no se me pide hacer una cantidad excesiva.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
13. Dispongo de suficiente tiempo para hacer mi trabajo.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
14. No recibo pedidos contradictorios de los demás.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
15. Mi trabajo me obliga a concentrarme durante largos periodos de tiempo.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.

16. Mi tarea es interrumpida a menudo y debo finalizarla más tarde.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
17. Mi trabajo es muy dinámico.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
18. A menudo me retraso en mi trabajo porque debo esperar al trabajo de los demás.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
19. Mi jefe se preocupa por el bienestar de los trabajadores que están bajo su supervisión
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
20. Mi jefe presta atención a lo que digo.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
21. Mi jefe tiene una actitud hostil o conflictiva hacia mí.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
22. Mi jefe facilita la realización del trabajo.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.
 - ☐ De acuerdo.
 - ☐ Completamente de acuerdo.
23. Mi jefe consigue que la gente trabaje unida.
- ☐ Totalmente en desacuerdo.
 - ☐ En desacuerdo.

- ☐ De acuerdo.
☐ Completamente de acuerdo.
24. Las personas con las que trabajo están cualificadas para las tareas que realizan.
☐ Totalmente en desacuerdo.
☐ En desacuerdo.
☐ De acuerdo.
☐ Completamente de acuerdo.
25. Las personas con las que trabajo tienen actitudes hostiles hacia mí.
☐ Totalmente en desacuerdo.
☐ En desacuerdo.
☐ De acuerdo.
☐ Completamente de acuerdo.
26. Las personas con las que trabajo se interesan por mí.
☐ Totalmente en desacuerdo.
☐ En desacuerdo.
☐ De acuerdo.
☐ Completamente de acuerdo.
27. Las personas con las que trabajo son amistosas.
☐ Totalmente en desacuerdo.
☐ En desacuerdo.
☐ De acuerdo.
☐ Completamente de acuerdo.
28. Las personas con las que trabajo se apoyan mutuamente para trabajar juntas.
☐ Totalmente en desacuerdo.
☐ En desacuerdo.
☐ De acuerdo.
☐ Completamente de acuerdo.
29. Las personas con las que trabajo facilitan la realización del trabajo.
☐ Totalmente en desacuerdo.
☐ En desacuerdo.
☐ De acuerdo.
☐ Completamente de acuerdo.

EDAD: _____ **SEXO** _____ **PROFESIÓN** _____

ANTIGÜEDAD _____ **PUESTO** _____

Gracias por sus respuestas y su tiempo.