Effect of Shift Work on Health and Job Satisfaction of European Workers (EU-28): A Cross-sectional and Longitudinal Study

Efecto del trabajo a turnos en la salud y la satisfacción laboral de los trabajadores europeos (UE-28). Estudio transversal y longitudinal

María-Carmen Sánchez-Sellero
c.sanchez@udc.es
Universidade da Coruña

Pedro Sánchez-Sellero
pedross@unizar.es
Universidad de Zaragoza

Elena Fernández-Sánchez
elena.fernandez.sanchez@udc.es
Universidade da Coruña

Abstract

This study examines job satisfaction and health status among shift workers, as well as the potential relationships between these two dimensions, using data from the EU-28. The methodology includes correlation matrix, correspondence analysis, and logistic regression. The results indicate that workers on rotating shifts are the most negatively affected group. Shift workers are 1.321 times less likely to report job satisfaction compared to non-shift workers, while individuals who rate their health as very good are 4.757 times more likely to be satisfied with their jobs than those in the reference category. In most EU-28 countries, the proportion of shift workers who report being very satisfied is higher than that of those who describe themselves as very healthy. There is a direct relationship between subjective perceptions of job satisfaction and health.

Keywords: work shifts; health; job satisfaction; EU; correlations.

R<small>ESUMEN</small>

Este trabajo analiza la satisfacción y la salud de los trabajadores a turnos, así como las posibles relaciones entre estos términos a partir de datos de la EU-28. Utilizamos matriz de correlación, análisis de correspondencias y regresión logística. El colectivo más perjudicado es el de los trabajadores a turnos rotativos. La satisfacción de los trabajadores a turnos es 1,321 veces menor que la de aquellos que no están a turnos, mientras que los que tienen muy buena salud están 4,757 veces más satisfechos que su categoría de referencia. El porcentaje de trabajadores a turnos que se declaran muy satisfechos supera a los que se sienten muy saludables para la mayoría de los países de la UE-28. Las percepciones subjetivas tanto en el trabajo (satisfacción laboral) como en la salud (sentirse saludable) tienen una relación directa.

Palabras clave: turnos de trabajo; salud; satisfacción laboral; UE; correlaciones.

JEL Classification / Clasificación JEL: I18, C42, C51, J28, F01.

1. INTRODUCTION

This paper studies shift work, in particular its impact on health and job satisfaction. This topic is relevant for several reasons. First, working and employment conditions are key determinants of health and overall well-being. Second, the workplace offers an ideal setting for interventions involving the direct participation (García et al., 2016) of workers. Third, work is not a neutral factor in matters of occupational health (Rodriguez, 2013). The existing literature consistently shows that shift workers are exposed to numerous adverse health effects. From a psychological perspective, the most frequently reported issues include work-related stress (Vásquez-Trespalacios et al., 2016), sleep disorders (Casjens et al., 2022), metabolic syndrome (Lim et al., 2018; Santos et al., 2018; Khosravipour et al., 2021), chronic fatigue, depressive symptoms, and challenges in family and social life (Fernández and Piñol, 2000). Compared to standard work schedules, shift work is also associated with a higher incidence of job-related problems such as reduced performance, absenteeism, and workplace accidents (Fernández and Piñol, 2000). For instance, Frick et al. (2018) analyzed the cost of shift work for companies in terms of absenteeism.

Although many studies have addressed the effects of shift work on health and job satisfaction separately, few have explored the combined impact on both or the interrelationship between these two variables. Most existing research, moreover, focuses on specific occupational groups (Omidi et al., 2017), particularly in the healthcare sector- (Gouzou et al., 2015; D'Ettorre and Pellicani, 2020; Carugno et al., 2021, among others). Recently, Seitz and Rigotti (2018) analyzed the influence of working time on job satisfaction and subjective health using data from Germany; in Spain, Sánchez-Sellero (2021). We do not find any research that analyzes these relations (shift work, health and satisfaction) using a database of all workers of European countries (EU-28). This study, therefore, represents a major contribution to this field, with widely generalizable results and conclusions.

Merino et al. (2023) also use data from European workers to analyze health and well-being; however, these authors do so from the perspective of gender differences.

Both health and job satisfaction are subjective perceptions: two individuals in identical circumstances may report different levels of each. This study

investigates the relationship between shift work and both perceptions, while also considering the effect of time in previous relationships.

Although shift work, health, and job satisfaction have been widely researched, the specific scope addressed in this study has received less attention, and current knowledge in this area remains limited. This study draws on a sample of workers from various European countries.

In this context, the research is structured around the following working hypotheses:

Hypothesis 1: Shift work has a negative effect on workers' health in the European Union (EU-28).

*Hypothesis 2: Shift work is associated with lower levels of job satisfaction across EU-28 countries.*

Hypothesis 3: There are significant cross-country differences in the levels of health and job satisfaction among shift workers in the EU-28, with a distinct temporal evolution between 2005 and 2015.

Hypothesis 4: There is a statistically significant correlation between shift work, self-perceived health, and job satisfaction among workers in the EU-28.

Hypothesis 5: Time has a significant effect on the relationships between shift work, health, and job satisfaction.

Hypotheses 1, 2, and 4 are addressed through a cross-sectional approach, while hypotheses 3 and 5 are examined using longitudinal data. The overall research design and methodological steps are summarized in Figure 1.

FIGURE 1. STEPS TO DEVELOP IN THE RESEARCH PROCESS
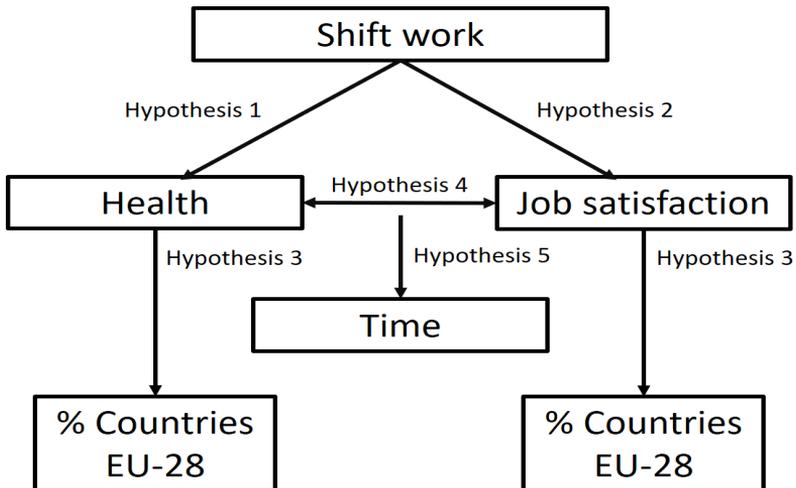
Source: own elaboration.

Following this introduction, the paper is organized into the following sections: theoretical framework, materials and methods, results, discussion, and conclusions.

2. Theoretical framework

Within the European Union, Directive 2003/88/EC of the European Parliament and of the Council on certain aspects of the organization of working time (Diario Oficial de la Unión Europea, 2003) requires Member States to take measures to ensure that night and shift workers are afforded appropriate safety and health protections according to the specific nature of their work.

Parra (2003) noted that night shifts and prolonged workdays can exacerbate pre-existing health conditions. Night work disrupts the body's natural physiology; even permanent night workers struggle to fully adapt, as human physiology is not inherently suited to nocturnal activity. Along these lines, Shevchuk et al. (2019) found that night work has negative effects on workers' subjective well-being.

Similarly, Gil-Monte (2012) argued that the organization of working time—including factors such as shift type, workday duration, rest periods, holiday work, and night shifts—can significantly affect workers' health. Iskra-Golec et al. (2017) found that rapid rotation systems (one to three consecutive shifts of the same type) and daytime work schedules are less disruptive, both biologically and socially, than slower rotation systems (e.g., alternating between afternoon and night shifts). However, their study did not find significant differences in health or job satisfaction outcomes. Additionally, González (2018) showed that greater physical work intensity is associated with a higher likelihood of working split shifts.

Extrinsic circadian rhythm disorders can be caused by shift work or may develop secondarily due to inappropriate sleep–wake patterns (Boivin and Boudreau, 2014). Symptoms such as insomnia or hypersomnia are common among workers whose schedules overlap with typical sleep periods. Night and early morning shifts, as well as rotating schedules, reduce sleep duration (Garde et al., 2020) and disrupt the circadian sleep–wake cycle (Gállego et al., 2007). Night shifts, in particular, should not be extended, and scheduling back-to-back night shifts should be avoided.

Job satisfaction has been widely studied as a multidimensional construct (Porcel-Gálvez et al., 2014), and its explanation is shaped by various factors or variables (Sánchez-Sellero et al., 2018, Gutiérrez et al., 2022). However, most research points to work-related variables as having the greatest influence (Dueñas et al., 2010). Given that human resources are often considered the most valuable asset for organizational success (Stankeviciene et al., 2017), it is essential to acknowledge that organizational goals cannot be fully achieved without a high level of affective commitment (Hitka et al., 2015; Lorincová et al., 2019) and job satisfaction among employees (Riyanto et al., 2021).

Dall'Ora et al. (2016) found that rotating shifts were associated with poorer job performance, while fixed night shifts allowed for some degree of resynchronization. However, employees on fixed night shifts reported lower levels of job satisfaction. In contrast, regular breaks were shown to have a positive effect on workers' fatigue and alertness levels.

Khammar et al. (2017) observed that shift work has a negative impact on quality of working life. Their empirical study revealed that employees who voluntarily chose shift work reported higher levels of job satisfaction than those assigned to it involuntarily. Compared to day shift workers, individuals on rotating night schedules exhibited significantly lower job satisfaction, reduced sleep quantity and quality, higher levels of chronic fatigue, and more frequent psychological and cardiovascular problems (Ferri et al., 2016). Haile's (2023) findings also showed that precarious employment conditions are associated with poorer health outcomes, with employees in the most insecure jobs faring particularly poorly. The adverse effects of long working hours and shift work on the physical and mental health of manual workers should not be underestimated (Xie et al., 2023). Herold et al. (2023) in Europe and Tancredi et al. (2023) conducted similar research. Finally, Šimunić and Gregov (2012) reported that morning shifts are associated with higher levels of the evaluative dimension of job satisfaction.

3. Material and methods

The European Working Conditions Survey (EWCS), conducted by the European Foundation for the Improvement of Living and Working Conditions (Eurofound), covers a wide and diverse range of workers across all European countries, occupations, sectors, and age groups. The survey's findings inform policy decisions by highlighting actions that can help policymakers address the challenges of contemporary Europe. Based on a standardized questionnaire, the EWCS involves a random sample of employees and self-employed individuals who are representative of the active population in each EU country.

The EWCS is typically conducted once every five years (2005, 2010, 2015, 2021). Due to the COVID-19 pandemic, Eurofound (2022) suspended face-to-face interviews for the 2020 edition. As a result, the 2021 edition—rebranded as the European Working Conditions Telephone Survey (EWCTS)—adopted a different method of data collection, rendering it non-comparable with previous survey waves. Consequently, this study will only use data from surveys conducted from 2005, 2010 and 2015.

Although the sixth EWCS (Eurofound, 2018) was conducted in 2015, the results were published in 2017. While the survey included 35 countries, the present study focuses exclusively on the 28 Member States of the European Union (EU-28). In 2015, a total of 43,850 workers were interviewed about various aspects of their working lives, including working hours, work environment, physical and psychosocial risks, and issues related to health and well-being. Respondents were required to be at least 15 years old (or

16 in countries such as Spain, where this is the legal minimum working age), reside in one of the surveyed countries, and meet the definition of being "in employment"—i.e., having worked for pay or profit for at least one hour during the week prior to the interview.

This study uses data from the sixth EWCS to select variables related to shift work, shift type, health, and job satisfaction. In addition to these core variables, the logistic regression model incorporates several control variables related to personal characteristics (e.g., age, gender) and job-related aspects (e.g., salary, opportunities for promotion, recognition of work, colleagues, organizational motivation, and employee type based on employer type). All analyses were weighted using the w5_EU28 weight (i.e., weights for country groups), in accordance with the EWCS methodological guidelines. A detailed description of the variables and their categories is provided in Table 1.

TABLE 1. VARIABLES AND THEIR CORRESPONDING CATEGORIES

NAME OF THE VARIABLE	CATEGORIES
Work shifts	- Yes - No
If they answered yes in the previous question: Shifts Types	- Day split shifts (with a break of at least 4 hours in between) - Permanent shifts (morning / afternoon / night) - Alternating / rotating shifts - Other
How would you rate your health in general?	- Very good - Good - Fair - Bad - Very bad
How would you rate your satisfaction with your working conditions?	- Very satisfied - Satisfied - Not very satisfied - Not at all satisfied
Variables in the LOGISTIC REGRESSION model	
Satisfied or very satisfied (dependent variable)	
Age	
Gender	- Man - Woman
I feel I get paid appropriately	
My job offers good prospects for career advancement	- Strongly agree - Tend to agree - Neither agree nor disagree - Tend to disagree - Strongly disagree
I receive the recognition I deserve for my work	
I generally get along well with my work colleagues	
The organization I work for motivates me to perform at my best	
How is your health in general? Would you say it is	- Very good - Good - Fair - Bad - Very bad

NAME OF THE VARIABLE	CATEGORIES
Do you work shifts?	- Yes - No
Are you employed or self-employed?	- Employee - Self employed

Source: own elaboration based on the Sixth European Working Conditions Survey, 2015.

The methodological approach employed in this study included a correlation matrix, correspondence analysis, and binary logistic regression, all conducted using SPSS. Correspondence analysis was used to graphically explore dependency relationships between qualitative variables based on contingency tables. Each category was represented as a point in R^n (typically a plane, where n = 2), such that the proximity or distance between points reflected the strength of association between categories. Visual interpretation was enhanced through the application of symmetric normalization, allowing categories located close together—particularly when distant from the center of gravity—to be interpreted as meaningfully associated (i.e. the origin of the coordinate system).

The main objective of the logistic regression (logit) is to model how the probability of occurrence of an event, in this case dichotomous, as it is a binary logistic regression, influences a set of explanatory variables, whether dichotomous, categorical, and/or quantitative (Agresti, 2012; Hosmer et al., 2013, among others).

Let Y represent the binary dependent variable (taking values 0 or 1), and $(X_1, X_2, …, X_k)$ a set of observed independent variables used to predict or explain the value of Y. The objective is to determine:

$$P(Y = 1 / X_1, X_2, …, X_k)$$
[1]

$$P(Y = 0 / X_1, X_2, …, X_k) = 1 - P(Y = 1 / X_1, X_2, …, X_k)$$
[2]

The binary logistic regression model establishes the following relationship between the probability of the event occurring, given that in each case the values ($X_1 = x_1$, $X_2 = x_2$,…,$X_k = x_k$) are observed:

$$P(Y = 1/x_1, x_2, …, x_k) = \frac{1}{1 + e^{(-\beta_0 - \beta_1 x_1 - \beta_2 x_2 - \cdots - \beta_k x_k)}}$$
[3]

The goal is to identify the coefficients $(\beta_0, \beta_1, \beta_2, …, \beta_k)$ that best fit the functional expression of the model:

The *odds ratio* is the quotient of probabilities:

$$odds - ratio = \frac{P(Y = 1/ x_1, \ x_2, …, x_k)}{1 - P(Y = 1/ x_1, \ x_2, …, x_k)} = e^{\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k}$$
[4]

Taking logarithms in the previous expression yields the linear expression:

$$Ln\left[\frac{P(Y = 1/x_1, x_2, ..., x_k)}{1 - P(Y = 1/x_1, x_2, ..., x_k)}\right] = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k \qquad [5]$$

The logit model was estimated using the Maximum Likelihood method. Due to the model's nonlinear nature, the β coefficients cannot be directly interpreted. Instead, odds ratios are used as statistical measures that quantify the relative likelihood of the presence or absence of a given factor, assuming all other variables in the model are held constant. An odds ratio close to 1—corresponding to a βi coefficient near zero—indicates that changes in the explanatory variable have no significant effect on the dependent variable.

In this study, the dependent variable is job satisfaction, recoded in two categories (1 = satisfied or very satisfied; 0 = not very satisfied or not at all satisfied). The independent variables are those listed in Table 1. The analysis, therefore, focuses on assessing the effect of each independent variable on the probability of reporting being satisfied or very satisfied.

4. Results

Hypothesis 1: Shift work has a negative effect on workers' health in the European Union (EU-28).

According to the data, 21% of respondents work in shifts; of these, 40% work fixed shifts and 48.8% work in rotating or alternating shifts. Overall, 78.3% of all respondents report being in good or very good health. This proportion decreases slightly among shift workers to 77.2%, and further to 76.4% among those on rotating shifts, reflecting a decrease of 1.9 percentage points. The total number of shift workers is N = 7,337.

Hypothesis 2: Shift work is associated with lower levels of job satisfaction across EU-28 countries.

Regarding job satisfaction, 86% of all workers report being satisfied or very satisfied with their job. This proportion decreases by 5.1 percentage points among shift workers, while the figure drops to 80.2% among those on rotating shifts, a decrease of 5.8 percentage points compared to the total.

Hypothesis 3: There are significant cross-country differences in the levels of health and job satisfaction among shift workers in the EU-28, with a distinct temporal evolution between 2005 and 2015.

This study aims to determine, for each EU-28 country, the percentages of shift workers who report being satisfied or very satisfied with their job, as well as those who rate their health as good or very good, using the most recent data from the EWCS (2005, 2010, 2015). For this analysis, the variables related to job satisfaction and health were recoded as follows:

Recoded job satisfaction variable → 1 = satisfied or very satisfied, 2 = not very satisfied or not at all satisfied,

Recoded health variable → 1 = good or very good, 2 = fair, 3 = bad or very bad.

The relationship between these two variables was visually represented using a radial chart (Table 2 and Figure 2), displaying the percentage of workers coded as 1 (i.e. satisfied/healthy) for both variables in the 2015 EWCS. Additionally, Table 2 includes two extra columns to show cases where job satisfaction percentages exceed those for health.

TABLE 2. PERCENTAGE OF SHIFT WORKERS IN EU-28 COUNTRIES REPORTING BEING SATISFIED OR VERY SATISFIED WITH THEIR JOB AND FEELING HEALTHY OR VERY HEALTHY, ACCORDING TO THE 4TH, 5TH AND 6TH EUROPEAN WORKING CONDITIONS SURVEYS (2005, 2010 AND 2015).

Country	Satisfied-very satisfied (Job satisfaction)			Good-very good (Health)*		Differences	
	2005 - 4th EWCS	2010 - 5th EWCS	2015 - 6th EWCS	2010 - 5th EWCS	2015 - 6th EWCS	2010 - 5th EWCS	2015 - 6th EWCS
Belgium	85.50%	87.90%	83.90%	81.80%	77.70%	Satisf > Health	Satisf > Health
Bulgaria	57.90%	68.90%	86.30%	80.80%	83.20%		Satisf > Health
Czech Republic	67.20%	67.40%	85.40%	74.40%	84.90%		Satisf > Health
Denmark	93.90%	85.30%	91.30%	72.70%	83.00%	Satisf > Health	Satisf > Health
Germany	75.80%	80.30%	82.50%	71.80%	74.80%	Satisf > Health	Satisf > Health
Estonia	60.00%	72.20%	84.00%	58.80%	57.70%	Satisf > Health	Satisf > Health
Greece	56.90%	68.60%	75.00%	90.00%	92.20%		
Spain	77.00%	76.20%	80.80%	84.60%	79.40%		Satisf > Health
France	76.90%	71.30%	71.20%	74.80%	79.40%		
Ireland	81.50%	86.80%	80.60%	94.30%	89.70%		
Italy	66.50%	79.40%	81.70%	81.00%	70.00%		Satisf > Health
Cyprus	80.00%	80.00%	75.00%	80.00%	88.90%		
Latvia	57.70%	67.60%	76.70%	45.50%	50.00%	Satisf > Health	Satisf > Health
Lithuania	62.50%	58.30%	76.90%	60.40%	60.00%		Satisf > Health
Luxembourg	66.70%	75.00%	87.50%	100.00%	75.00%		Satisf > Health
Hungary	71.60%	65.70%	83.30%	60.60%	82.40%	Satisf > Health	Satisf > Health
Malta	75.00%	83.30%	83.30%	83.30%	83.30%		
Netherlands	82.60%	86.00%	86.80%	83.00%	78.40%	Satisf > Health	Satisf > Health
Austria	87.10%	87.20%	84.30%	69.00%	69.00%	Satisf > Health	Satisf > Health
Poland	77.20%	82.90%	80.50%	76.40%	77.60%	Satisf > Health	Satisf > Health
Portugal	75.80%	79.80%	85.50%	66.30%	78.80%	Satisf > Health	Satisf > Health

| Country	Satisfied-very satisfied (Job satis-faction)			Good-very good (Health)*		Differences	
	2005 - 4th EWCS	2010 - 5th EWCS	2015 - 6th EWCS	2010 - 5th EWCS	2015 - 6th EWCS	2010 - 5th EWCS	2015 - 6th EWCS
Romania	62.40%	75.40%	88.20%	60.80%	76.00%	Satisf > Health	Satisf > Health
Slovenia	66.70%	63.40%	73.00%	72.50%	75.70%		
Slovakia	72.40%	75.30%	79.20%	65.90%	73.90%	Satisf > Health	Satisf > Health
Finland	80.00%	87.80%	84.40%	74.70%	76.30%	Satisf > Health	Satisf > Health
Sweden	82.40%	86.80%	76.30%	80.30%	72.70%	Satisf > Health	Satisf > Health
United Kingdom	83.10%	85.70%	81.20%	85.20%	75.80%	Satisf > Health	Satisf > Health
Croatia	65.60%	67.00%	75.50%	71.00%	79.60%		
Total	74.70%	78.20%	80.90%	76.50%	76.80%	Satisf > Health	Satisf > Health

* There are no health data for the year 2005.
Source: own elaboration based on the Fourth, Fifth and Sixth European Working Conditions Surveys, 2005, 2010 and 2015.

Hypothesis 4: There is a statistically significant correlation between shift work, self-perceived health, and job satisfaction among workers in the EU-28.

A correlation matrix revealed the associations between these variables (Table 3), and also indicated which of these relationships are statistically significant (p-value less than 0.05).

Figure 2. Radial chart showing the percentages of shift workers in EU-28 countries reporting being satisfied or very satisfied with their job and feeling healthy or very healthy, according to the 6th European Working Conditions Surveys (2015)
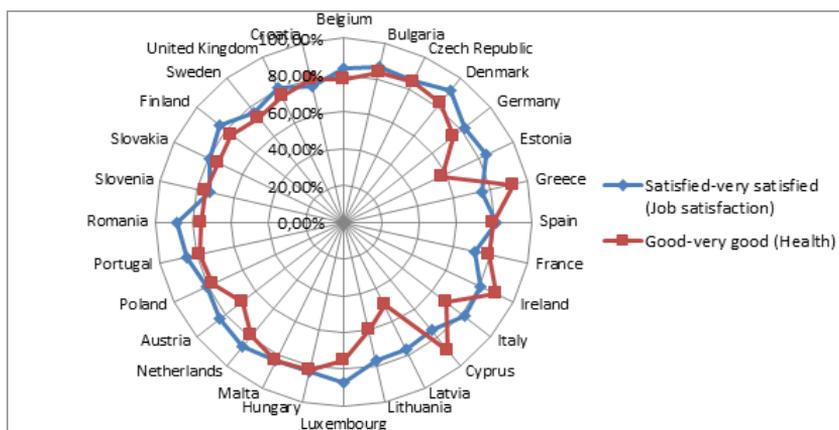
Source: own elaboration based on the Sixth European Working Conditions Surveys, 2015.

TABLE 3. MATRIX OF CORRELATIONS. VARIABLES: SHIFT WORK, HEALTH AND WORK SATISFACTION
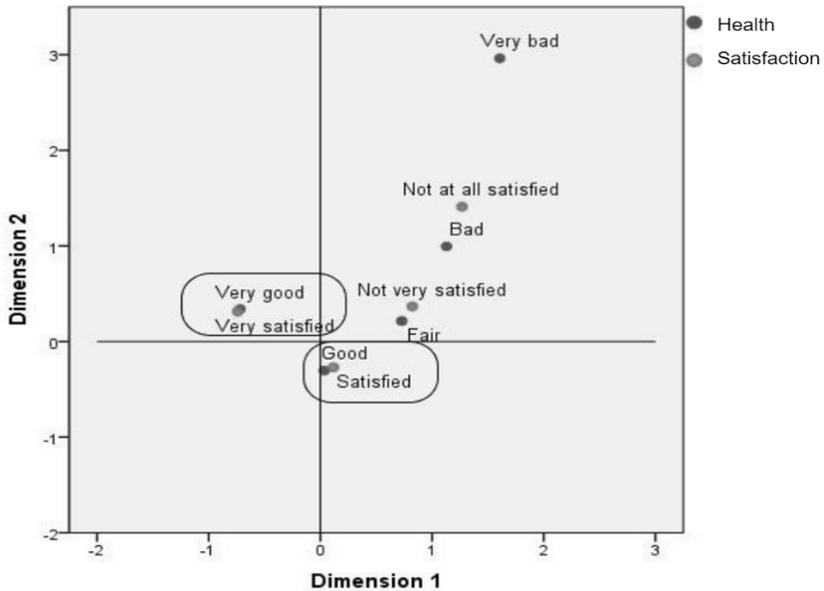
	Shifts	Health	Satisfaction
Shifts	1		
Health	Phi = 0.067 * Cramer´s V = 0.038 * Contingency coef. = 0.066 *	1	
Satisfaction	Phi = 0.063 * Cramer´s V = 0.037 * Contingency coef. = 0.063 *	Phi = 0.305 * Cramer´s V = 0.176 * Contingency coef. = 0.292 * Kendall´s Tau-c = 0.194 * Gamma = 0.404 * Somers d = 0.246 *	1

*Note: p-value < 0,05.
Source: own elaboration based on the Sixth European Working Conditions Surveys, 2015.

A correspondence analysis was conducted between health and job satisfaction, as these two variables (Gamma = 0.404) exhibited the highest and most significant correlation. Table 4 summarizes the correspondence analysis and examines the row and column points for both health and job satisfaction variables, while Figure 3 provides their graphical representation. Although the results presented (Table 4 and

FIGURE 3. CORRESPONDENCE ANALYSIS. SYMMETRIC NORMALIZATION METHOD. VARIABLES: HEALTH AND JOB SATISFACTION

Source: own elaboration based on the Sixth European Working Conditions Surveys, 2015.

TABLE 4. CORRESPONDENCE ANALYSIS. CONTRIBUTIONS TO THE TOTAL INERTIA BY DIMENSION, ROW POINTS, AND COLUMN POINTS. VARIABLES: HEALTH AND JOB SATISFACTION

Dimension	Own value	Inertia	Chi square	Sig.	Inertia percentage		Confiance for own value
				Abstract	Explained	Accumulated	Standard deviation
1	0.271	0.074			0.790	0.790	0.005
2	0.136	0.018			0.198	0.987	0.006
3	0.034	0.001			0.013	1.000	
Total		0.093	3309.046	0.000[a]	1.000	1.000	

Row Points[b]

Health	Load	Score in dimension		Inertia	Contribución		
		1	2		Of the dimension in the inertia of the point		
					1	2	Total
Very good	0.259	-0.719	0.340	0.040	0.899	0.101	0.999
Good	0.526	0.035	-0.304	0.007	0.025	0.956	0.981
Fair	0.190	0.729	0.215	0.029	0.945	0.041	0.986
Bad	0.022	1.129	0.995	0.011	0.706	0.274	0.980
Very bad	0.003	1.607	2.963	0.006	0.347	0.591	0.939
Total active	1.000			0.093			

Column Points[b]

Satisfaction	Load	Score in dimension		Inertia	Contribución		
		1	2		Of the dimension in the inertia of the point		
					1	2	Total
Very satisfied	0.264	-0.741	0.314	0.043	0.917	0.083	1.000
Satisfied	0.597	0.116	-0.270	0.008	0.270	0.723	0.992
Not very satisfied	0.114	0.823	0.368	0.024	0.887	0.089	0.976
Not at all satisfied	0.026	1.268	1.410	0.019	0.601	0.371	0.972
Total active	1.000			0.093			

a. 12 degrees of freedom
b. Symmetric Normalization
Source: own elaboration based on the Sixth European Working Conditions Surveys, 2015.

Figure 3) refer to the total number of workers in the EU-28, a similar analysis was performed separately for shift and non-shift workers, yielding comparable outcomes.

To further explore the dependencies between shift work, health, and job satisfaction, a binary logistic regression analysis was also conducted, as shown in Table 5. In this analysis, the dependent variable is job satisfaction, recoded as dichotomous (1 = satisfied or very satisfied; 0 = not very satisfied or not at all satisfied). The independent variables include workers' personal characteristics, various work-related factors, as well as shift work and health (Table 1).

TABLE 5. BINARY LOGISTIC REGRESSION. PARAMETER ESTIMATES. DEPENDENT VARIABLE: JOB SATISFACTION

Satisfied - very satisfied[a]		B	Standard error	Sig.	Exp(B)
	Intersection	-2.504	0.357	0.000	
Age		0.016	0.002	0.000	1.016
Gender	Man	-0.039	0.041	0.342	0.962
	Woman	0[b]	.	.	.
I feel I get paid appropriately	Strongly agree	1.385	0.108	0.000	3.996
	Tend to agree	1.281	0.067	0.000	3.600
	Neither agree nor disagree	0.927	0.066	0.000	2.528
	Tend to disagree	0.311	0.058	0.000	1.364
	Strongly disagree	0[b]	.	.	.
My job offers good prospects for career advancement	Strongly agree	1.007	0.112	0.000	2.738
	Tend to agree	0.913	0.068	0.000	2.492
	Neither agree nor disagree	0.709	0.060	0.000	2.032
	Tend to disagree	0.384	0.055	0.000	1.468
	Strongly disagree	0[b]	.	.	.
I receive the recognition I deserve for my work	Strongly agree	1.660	0.111	0.000	5.258
	Tend to agree	1.446	0.082	0.000	4.246
	Neither agree nor disagree	0.847	0.079	0.000	2.333
	Tend to disagree	0.294	0.077	0.000	1.342
	Strongly disagree	0[b]	.	.	.
I generally get along well with my work colleagues	Strongly agree	-0.280	0.169	0.098	0.756
	Tend to agree	-0.621	0.169	0.000	0.537
	Neither agree nor disagree	-1.027	0.178	0.000	0.358
	Tend to disagree	-0.697	0.200	0.001	0.498
	Strongly disagree	0[b]	.	.	.
The organization I work for motivates me to perform at my best	Strongly agree	1.181	0.105	0.000	3.259
	Tend to agree	1.174	0.081	0.000	3.236
	Neither agree nor disagree	0.717	0.077	0.000	2.047
	Tend to disagree	0.017	0.077	0.827	1.017
	Strongly disagree	0[b]	.	.	.
How is your health in general? Would you say it is	Very good	1.560	0.306	0.000	4.757
	Good	1.261	0.303	0.000	3.530
	Fair	0.679	0.304	0.026	1.972
	Bad	0.452	0.321	0.159	1.572
	Very bad	0[b]	.	.	.

Do you work - Shifts?	Yes	-0.278	0.044	0.000	0.757
	No	0[b]	.	.	.
Are you employed or self-employed?	Employee	0.217	0.083	0.009	1.242
	Self-employed	0[b]	.	.	.
Goodness of the model					
R² Nagelkerke = 0.396 R² McFadden = 0.307 Model Classification = 88.4%					

a. The reference category is not very satisfied- not at all satisfied.
b. This parameter is set to 0 because it is redundant.
Source: own elaboration based on the Sixth European Working Conditions Surveys, 2015.

Hypothesis 5: Time has a significant effect on the relationships between shift work, health, and job satisfaction.

Although this study adopts both cross-sectional and longitudinal approaches, a clearer understanding of the effects of shift work would likely emerge from tracking the same group of workers over time. Evidence from Koller et al. (1990) supports this perspective: in a five-year longitudinal study, the quality of sleep following night shifts was significantly poorer among shift workers. Over the same period, job and life satisfaction declined among this group, while both indicators tended to improve among day workers. The comparison also revealed a notable deterioration in the health status of shift workers. These findings underscore the destabilizing nature of shift work, which, when sustained over time, may lead to adverse consequences for health and well-being. Unlike the temporary symptoms of jet lag, repeated exposure to rotating schedules over several years has been linked to more persistent disorders (Moore-Ede and Richardson, 1985).

5. Discussion

The results section (development of *Hypothesis 1*) revealed that workers on rotating shifts reported worse health compared to the total group (-1.9%), although our initial expectations led us to believe this drop would be greater.

Regarding *Hypothesis 2*, workers on rotating shifts were less satisfied (-5.8%) than the overall worker population. The study by Juarez-Adauta (2012) shows that job satisfaction was highest among permanent daytime workers, followed by morning and evening shift workers. Night shift workers reported the lowest job satisfaction (p < 0.002).

Therefore, shift work has an influence on both health (*hypothesis 1*), and job satisfaction (*hypothesis 2*). Based on the results derived from the *Hypotheses 1 and 2*, it was found that, among shift workers, the negative effect was greater on job satisfaction than on health, with the group of rotating shift workers being the most affected.

In the breakdown by EU-28 country (*Hypothesis 3*), Figure 2 and Table 2 show that, in 2015, job satisfaction tended to be higher than health ratings,

with only a few exceptions (Greece, France, Ireland, Cyprus, Slovenia and Croatia). The last two columns of Table 2 also demonstrate that, in most EU-28 countries, the percentage of shift workers who reported being very satisfied exceeded the percentage who considered themselves very healthy, both in 2010 and 2015, and even in the EU-28 totals.

To support *Hypothesis 4*, the correlation matrix was examined, which confirmed that the strongest association exists between self-reported health status and job satisfaction. This finding provided the rationale for conducting a correspondence analysis. Table 4 shows that the total inertia—representing the overall explanatory power of the extracted dimensions or axes—is 0.093. Although each individual inertia value (equal to a squared eigenvalue) is low, the three dimensions together account for 100% of the variance. The number of dimensions is determined by the variable with fewer categories, minus one; thus, given that job satisfaction comprises four categories and health five, the analysis yields three dimensions. The first dimension alone explains 79% of the inertia, while the first two dimensions together account for 98.7%, indicating that the underlying associations in the contingency table are effectively captured.

The sign of the coordinates (columns 3 and 4 of the row and column points) determines the spatial positioning of each category on the plane; for example, the category "very good health" is located at the corresponding point in the plane (Figure 3) at the point (-0.719, 0.340). In the last column, relative contribution values equal to or close to 1 reflect the high quality of all the points on the two dimensions.

Figure 3 illustrates associations between the categories "good health" and "satisfied" at work; similarly, individuals reporting "very good health" tend to be "very satisfied" with their jobs. This analysis was repeated for the total sample, as well as separately for shift workers and non-shift workers, yielding similar results across all groups. In line with these findings, Martín et al. (2007) report that employees experiencing stress, fatigue, and low satisfaction tend to perceive their work environment more negatively—an effect also observed among those with poor health. Likewise, Ruggiero (2005) concludes that having more free weekends per month and experiencing less emotional stress significantly contributes to job satisfaction in the group studied. Navarro-Abal et al. (2018) also find a positive correlation between job satisfaction and the positive dimensions of perceived health, particularly in terms of physical functioning and both physical and social role performance.

The binary logistic regression model presented in Table 5 shows a negative sign for the variable "Do you work shifts?: yes", indicating that shift work is associated with lower levels of job satisfaction. Negative coefficients (β_i) correspond to odds ratios (Exp(B)) less than 1, while positive coefficients yield odds ratios greater than 1. The inverse of odds ratios below 1 was calculated to facilitate comparison. Thus, holding all other variables constant, the odds of being satisfied at work are approximately 1 / 0.757, which is 1.321 times lower for shift workers compared to non-shift workers. Workers who report

being in "very good health" are 4.757 times more likely to be satisfied with their jobs than those in the reference category ("very bad health"). The model presents the following goodness-of-fit statistics: Nagelkerke's R^2 = 0.396 and McFadden's R^2 = 0.307, indicating adequate explanatory power. Additionally, the model demonstrates a satisfactory classification accuracy of 88.4%.

With respect to *Hypothesis 5*, the use of panel data would be valuable, as it would allow for tracking the same group of workers over time to assess their job satisfaction and health evaluations across different years. Unfortunately, this information is unavailable, as the EWCS do not track the same individuals across multiple years.

6. Conclusions

This paper explores the effects of shift work on health and job satisfaction. The findings confirm that shift work is associated not only with lower levels of job satisfaction but also with poorer health perceptions. The group most affected by the negative effects of shift work consists of workers on rotating shifts, with the impact on job satisfaction being more pronounced than the impact on health. However, initial expectations, particularly regarding health perceptions, were for even lower values compared to workers engaged in conventional work. This observation leads to the conclusion that time plays a crucial role and should be considered a relevant factor in this triangular relationship (shift work, health, and satisfaction).

Using data from the EWCS for 2010 and 2015, the percentages of EU-28 shift workers who report being very satisfied and feeling very healthy were compared. The analysis reveals that, in most countries and for the EU-28 total, the percentage of workers reporting high satisfaction exceeds that of those feeling very healthy.

Logistic regression revealed that shift workers are 1.321 times less likely to be satisfied compared to non-shift workers. Furthermore, workers in very good health are 4.757 times more likely to report being satisfied at work than those in the reference category (very bad health).

The major contribution of this study lies in its empirical demonstration, using correspondence analysis and the correlation matrix, that subjective perceptions of work (job satisfaction) and health (feeling healthy) are directly related. This relationship has been confirmed for the overall workforce as well as for shift and non-shift workers across the EU-28 countries. Satisfied workers tend to report being healthy, and those who are very satisfied at work are more likely to describe themselves as very healthy, indicating a positive correlation.

This knowledge carries practical implications, given the correlation between health and job satisfaction. Improving the factors that determine job satisfaction (which are intrinsically linked to the characteristics of the work itself) could positively impact workers' health. While this approach could also be framed in reverse—namely, could improvements in health status lead to an increase in job satisfaction?—the interrelation between these two factors

has already been demonstrated. A subsequent step would involve further exploring the underlying mechanisms driving these associations.

Despite using data from different years, a panel study would be necessary to expand on the conclusions, with the sample consisting of the same workers tracked over multiple years. However, the existing literature strongly supports the working hypothesis, which suggests that shift work exacerbates the negative effects on both health and job satisfaction.

Shift work, in addition to the characteristic lack of defined schedules, involves several significant factors that can have a considerable impact on workers. Therefore, employers should conduct a comprehensive analysis that goes beyond the technical skills and training of their employees. It is equally important for workers to consider the specific demands of this type of work and assess the various factors that may affect different aspects of their lives.

The shift work system does not alter the length of the workday, but rather its distribution. It is essential to acknowledge that certain sectors, such as healthcare, require personnel to be available 24 hours a day, which implies financial compensation for working during holidays, nights, or on-call shifts. To address this, it would be advisable to implement economic policy measures aimed at increasing productivity while achieving the objectives of all stakeholders involved in the process.

The adoption of appropriate working hours by companies and organizations, leading to efficient shift schedules, would allow workers to achieve a proper work-life balance. This, in turn, would yield dual benefits in terms of both health and job satisfaction.

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