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The role of organizational factors in promoting workers' health in the construction sector: A comprehensive analysis

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ABSTRACT

Introduction: The number of physical and mental problems caused by occupational accidents and diseases increases every year. To control them, the safety climate at work is a recognized critical factor. However, a widely applicable model to capture the safety climate for various industries and organizations is lacking.

Method: This study proposes a theoretical model to measure the direct and indirect effects of safety climate on workers' physical and mental health, mediated by job satisfaction, in the construction sector. We propose a multidimensional construct of safety climate, considering the most salient factors from the literature, and including psychological capital as a new factor. Using data from the last wave of the European Working Conditions Survey (2015) in Spain, the proposed model was validated using structural equation modeling.

Results: Our findings suggest that to further improve the mental health of construction workers, work-life balance and job rewards and compensation must be prioritized along with safety climate. As for physical health, safety climate and work-life balance are crucial. Finally, we provide some recommendations for construction company managers based on a ranking of all the factors affecting the safety climate and the workers' health.

1. Introduction

The construction sector does not show a significant reduction in reported accidents (Eurostat, 2020). This failure could be because companies in the construction sector have their own way of doing the work. In general, there are systemic and cultural reasons that restrict the implementation of the changes in the construction sector (Kramer et al., 2010). In most cases, productivity is still the first company's goal to achieve, and safety is often seen as a bureaucratic task to accomplish the law and refuse some possible fines (Choudhry, 2009; Fernandez-Muñiz et al., 2009; Forteza et al., 2017).

In 2019, in the European Union (EU), 3,408 occupational fatal accidents and 3.1 million nonfatal accidents were reported resulting in at least four days of work leave. There was an increase of 76 deaths and 16,122 nonfatal accidents compared to the previous year. Within the EU-27, 22.2 % of all these fatal accidents and 11.8 % of nonfatal accidents took place within the construction sector. That is, the highest incidence of nonfatal accidents at work was observed in the construction industry, with 3,211 accidents per 100,000 persons employed (Eurostat, 2019a). Regarding diseases, there is only one experimental European statistics database with aggregated data for all the Members of the UE-27 (Eurostat, 2019b). In Spain, there is a database from the Ministry of Inclusion, Social Security and Migrations of the Spanish Government, which reflects that in 2019 943 diseases were reported. There was an increase of 196 diseases compared to the previous year. With these figures, the construction sector is one of the industries with the higher accident and disease rates, affecting the workers' health and their well-being, thereby their quality of life.

In this line, EU institutions set as one of their main goals the improvement of occupational health and safety and the protection of workers' health (art.153 of the Treaty on the Functioning of the European Union states). Furthermore, in June 2021, the EU institutions approved the strategic framework on health and safety at work (2021–2027), highlighting that one of the key objectives is the need to

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improve the prevention of workplace accidents and diseases.

There are many safety approaches used by companies and researchers to determine the safety commitment of a company. Safety culture and safety climate have been deeply studied to identify internal factors that companies can manage to integrate safety into their processes and tasks, thereby enhancing safety outcomes such as workers' safety performance and health (Casey et al., 2017). Safety culture refers to the value placed on safety in a company over time, represented by its safety policies, management procedures, and actions (Guldenmund, 2000). On the other hand, safety climate is defined as workers' perceptions about the importance of safety in their company (Bergheim et al., 2015; Zohar, 2014). Safety climate represents a snapshot at a particular point in time of some aspects of the company's safety culture. Managers' decisions can improve the safety climate, and if these practices and efforts are constant over time, it can lead to a positive safety culture. While safety culture requires multiple methods of assessment over a long period of time, safety climate can be measured formally using survey tools designed to assess an individual's response to key areas of safety (Bergheim et al., 2015). Safety climate is recognized as a key factor in improving safety outcomes such as workers' safety performance and health (Choudhry et al., 2009; Clarke, 2010). The safety climate concept was introduced in the research literature by Zohar (1980), and since then, several studies have demonstrated a relationship between some aspects of the daily task conditions, safety climate, and safety outcomes such as accidents or diseases. Although the literature has evolved since Zohar's seminal work, it is essential to continue researching how safety climate affects safety performance and workers' health, specifically in the construction sector (Choudhry et al., 2009; Han et al., 2021; Luo, 2020).

To improve workers' health, it is essential to understand the relationship with the safety climate. To achieve this, research should provide implications that help policy-makers and managers to make decisions and practical ideas that could be implemented in the daily planning and organization of tasks carried out by small and medium-sized companies, with particular attention to safety climate.

In this paper, we aim to study the relationship between safety climate and workers' health through job satisfaction. Our objective is to identify the key factors that influence these variables and their relationships, with the goal of promoting a safer working environment and, finally, enhancing workers' health.

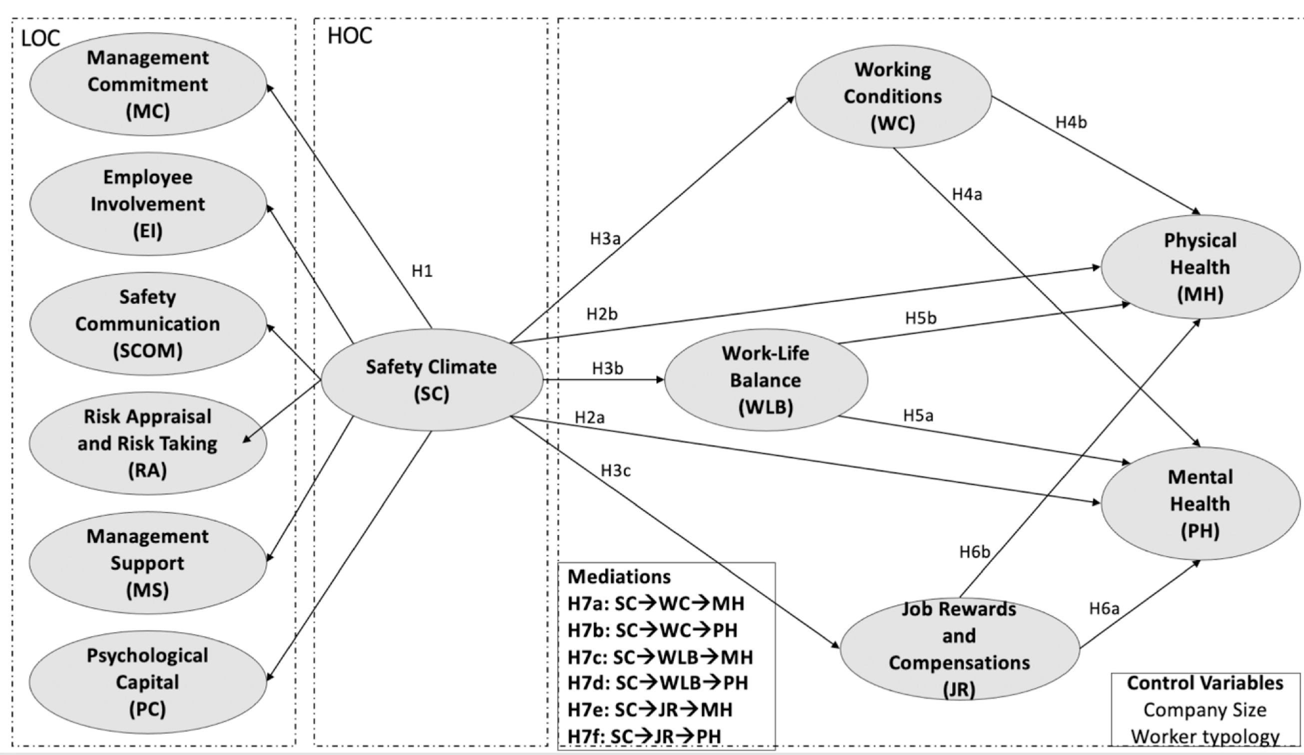
2. Literature review and hypotheses statement

Since the early 1980 s, there has been a lot of literature focused on safety climate and the different ways in which it can affect safety performance (Chen et al., 2021; Schwatka et al., 2016) and its relationship with some objective outcomes such as accidents (Ajslev et al., 2017; Aliabadi et al., 2020). Safety climate is a well-established concept to measure the company's approach to safety by its worker's perceptions in different industries and sectors as health (de Lima Silva Nunes et al., 2021), petrochemical industry (Karimpour et al., 2021), cement industry (Borgheipour et al., 2020), and construction sector (Andersen et al., 2018), among others.

Although there is great consensus on safety climate affecting safety outcomes, researchers have faced the studies in many different ways, considering different variables and methods. In this study, we want to check if safety climate affects the workers' health and if this effect is mediated by job satisfaction variables (see Fig. 1). In doing so, we have considered most of the variables highlighted in the literature to construct a mediation model.

2.1. Safety climate

As we have seen before, safety climate captures the workers' perceptions regarding safety in their company (Bergheim et al., 2015; Zohar, 2014) including several factors that can affect the performance of workers' tasks. Safety climate is a multidimensional concept (Zohar, 2000, 2014), so it is necessary to capture in it several factors of different natures. Many attempts have been made to find a model to develop a construct for safety climate, and many studies include similar factors



Note: LOC – Low Order Constructs; HOC – High Order Construct

Fig. 1. Theoretical model. Note: LOC – Low Order Constructs; HOC – High Order Construct.

(Luo, 2021). Moreover, several studies propose a specific model to construct safety climate for the construction sector (Choudhry et al., 2009; Han et al., 2021). However, there is currently no consensus on a single model for measuring safety climate (Han et al., 2021). As Bamel et al. (2020) suggest, it is necessary to continue researching safety climate and its specific factors.

Regarding the methodology to deal with multidimensional constructs, a second-order factor model is a useful approach (Chen et al., 2005). The higher-order factor is composed of the first-order factors, which are the sub-dimensions that made up the multidimensional construct (Hair et al., 2006). A second-order factor reduces the number of variables that need to be estimated in a structural model without losing measurement accuracy (Koufteros et al., 2009). Thus, the higher-order factor model provides a more parsimonious and interpretable model than a first-order factor model and therefore, has considerable potential for advancing research on a multidimensional construct (Nunkoo et al., 2017).

To provide a comprehensive understanding of the concept of safety climate, we have first checked the factors that have been commonly included in safety climate studies (Table 1). Zohar (1980) identified eight factors for measuring safety climate according to the workers' perceptions of the importance of safety training, management attitudes to safety, the effects of safe conduct on career advancement, the level of risk at the workplace, the effects of required work pace on safety, the status of safety officer, the effect of safe conduct on social status, and status of the safety committee. In a subsequent study, Zohar (2000) proposed a group-level model to measure safety climate, including management commitment, support, and safety communication items.

Some of the more relevant factors identified in the literature influencing safety climate include:

(a) As a first dimension of the concept, achieving a good safety climate requires the collaboration of all those involved in the building process, from management and supervisors to workers (Romero et al., 2019). Managers can improve the safety climate by recognizing employees for their good job, and fairly organizing and distributing their tasks (Goldenhar, Williams & Swanson, 2003). Thus, management commitment is the first factor reflecting the necessary responsibility of management for the safety issues within the company (Ajslev et al., 2017; Chan et al., 2017; Choudhry et al., 2009; Fang et al., 2006; Kim et al., 2021; Lingard et al., 2012; Mosly, 2019; Niu et al., 2016; Schwatka et al., 2016; Zhou et al., 2015).

(b) The second factor is employee involvement (Ajslev et al., 2017; Chan et al., 2017; Choudhry et al., 2009; Fang et al., 2006; Kim et al., 2021; Lingard et al., 2012; Mosly, 2019; Niu et al., 2016; Schwatka et al., 2016; Zhou et al., 2015). All participants in the process must do their part of the task to achieve improvements in the final workers' outcomes, such as health. The safety climate will be different if the employees are involved in doing a good job, and doing it safely. A way of enhancing the workers' involvement is by empowering them. This can be done by facilitating interactions between colleagues and giving employees the autonomy to apply their ideas, to decide what they think is essential for accomplishing their job duties, or to control the necessary time to do it. Arocena et al. (2008) pointed out that this empowerment can contribute to reducing the number of injuries, and it affects the safety climate by reinforcing worker involvement.

(c) The third factor is safety communication, which includes the communication between all those involved in any operational process, providing appropriate information and training to perform the jobs properly (Chan et al.,2017; Choudhry et al., 2009; Kim et al., 2021; Niu et al., 2016; Schwatka et al., 2016, Zohar, 2000). According to safety laws and regulations across Europe, employers must provide training to the workers, to provide them the knowledge, skills, and abilities to analyze their tasks and make decisions to perform them safely. To ensure good job performance, good communication in general and safety communication, in particular, are required. This communication must be fluid and bidirectional (from top to bottom in the company's hierarchical structure and vice versa). Empirical studies confirmed that better working environment conditions reduce accident results and that this effect is moderated by the quality of safety communication, especially when the communication comes from an immediate superior position, such as foremen (Jeschke et al., 2017). Regarding the effect of the work environment on safety climate during work performance, exposure to risks stands out. Avoiding workers' exposure to risk requires prior risk assessment and organization of human and material resources.

(d) Hence, the fourth factor of safety climate is risk appraisal and risk-taking. Furthermore, to perform a job safely, employees need support from company managers. Only in this way, the work will be done with the required resources, ensuring the integration of safety into all company processes.

(e) Thus, manager support is the fifth factor of safety climate (Ajslev et al., 2017; Kim et al., 2021).

Table 1
Factors of safety climate.

Safety climate factors	n°	Authors
Management commitment	10	Ajslev et al., 2017; Chan et al., 2017;Choudhry et al., 2009; Fang et al., 2006 ;Kim et al., 2021; Lingard et al., 2012 Mosly, 2019Niu et al., 2016 Schwatka et al., 2016 Zhou et al., 2015Zohar, 2000
Employee involvement	10	Ajslev et al., 2017 Chan et al., 2017Choudhry et al., 2009 Fang et al., 2006 Kim et al., 2021; Lingard et al., 2012Mosly, 2019.Niu et al., 2016 Schwatka et al., 2016 Zhou et al., 2015
Risk appraisal and risk-taking (behavior)	7	Chan et al., 2017Fang et al., 2006 Kim et al., 2021; Niu et al., 2016 Schwatka et al., 2016 Wang et al., 2018Zhou et al., 2015
Safety communication	6	Chan et al.,2017 Choudhry et al., 2009kim et al., 2021; Niu et al., 2016 Schwatka et al., 2016Zohar, 2000
Management support	3	Ajslev et al., 2017 Kim et al., 2021Zohar, 2000

Up to this point, we have included the factors that are commonly included in safety climate construct models. However, according to a recent systematic literature analysis of safety climate (Bamel et al., 2020), there is a gap in the literature concerning the implications of the psychological capital perspective in the safety climate construct. Psychological capital (PsyCap), is an index of positive work motivation (Bergheim et al., 2015). It is composed of four dimensions: (a) first, efficacy - the conviction in own abilities to carry out the work; (b) second, optimism - confidence in current and future success; (c) third, hope - to pursue the objectives and, if necessary, reorient the path to achieve them; and (d) fourth -resiliency -ability to sustain and recover to achieve success when a problem arises (Luthans, 2002; Stratman & Youssef-Morgan, 2019). Just a few studies have integrated the workers' PsyCap into the safety climate construct. Clarke (2010) stated that the psychological climate affected the safety climate and included this concept as an antecedent. In Bergheim et al. (2015) study, PsyCap has been shown to be positively related to workers' perception of safety climate, explaining between 10 and 12 % of the variance in workers' perceptions of safety climate in the maritime industry. Wang et al. (2018) noted that psychological capital positively influences safety compliance (safety regulations compliance) and participation (engagement and promotion of safety activities), and therefore, it is a factor to consider in improving the safety climate. In our measurement model, psychological capital will be the sixth and last factor considered to explain the safety climate. This supposes a contribution to the literature by being the first empirical study including psychological capital as a latent variable affecting safety climate specifically in the construction sector.

(See Appendix A reports the items forming each of the six factors composing safety climate).

Thus, regarding the safety climate construct, our hypotheses are stated as follows:

H1a. Management commitment, employee involvement, safety communication, risk appraisal and risk-taking, management support, and psychological capital are distinct, but related sub-dimensions of safety climate and can be accounted for by a common underlying second-order safety climate factor model, which is significantly better than a first-order safety climate factor model.

H1b. Including psychological capital as a new factor of a second-order safety climate factor model significantly improves the results of the model without considering this factor.

2.2. Safety climate – workers' health relationship

Several studies have shown that safety climate significantly influences safety outcomes, such as accidents (Ajslev, 2017; Aliabadi, 2021), which can cause immediate physical harm and potentially lead to mental issues as well, either when the accident occurs or afterward. Additionally, a better safety climate can improve workers' behavior (Chen et al., 2021; Clarke, 2010), but if it worsens, it can produce the opposite effect, thus affecting workers' mental health. In this line, Katz et al. (2019) carried out an empirical analysis of three big manufacturing companies and found that perceived positive safety climate was associated with increased physical activity and fewer mental health problems, such as sleeping problems or depression. Mental health is typically not considered in construction field studies, which is why we aim to study the relationship between safety climate and construction workers' health, differentiating between physical and mental health. Therefore, we state our second hypothesis as follows:

H2a. Safety climate has a direct positive and significant effect on workers' mental health.

H2b. Safety climate has a direct positive and significant effect on workers' physical health.

2.3. Job satisfaction

Some studies connect safety climate with safety outcomes through the mediator role of job satisfaction (Balogun et al., 2020; Clarke, 2010; Huang et al., 2016; Smith, 2018). Job satisfaction is hard to measure due to the lack of a common understanding of what job satisfaction refers to (Punzo et al., 2018). However, it is usually presented as a positive affective response to one's job (Locke, 1976; Clarke, 2010) or the workers' expectation about what some aspects of the work should be and what they actually are (Gomez-Baya & Lucia-Casademunt, 2018).

Following the criterion of most of the reviewed literature, we evaluate how certain factors affect overall job satisfaction. Most of them are extracted from the demand-control-support model (Karasek-Theorell, 1990) and the effort-reward imbalance model (Siegrist, 1996). These models are commonly used when researchers study job satisfaction (Punzo, 2018). They also posit that high work demand and low work control lead to adverse health outcomes (Phipps, 2012). Some of these studies studied the relationship between some specific characteristics of job satisfaction - such as working conditions - and mental health (Cottini & Lucifora, 2013) or physical health (Nappo, 2019). Also, recent approaches considered its effects on personal well-being (Bakhshi et al., 2008; Gomez-Baya & Lucia-Casademunt, 2018).

In this literature, we have found a set of four specific dimensions regarding individual work-related facets that are used to form the job satisfaction construct.

First, we identified the workers' profiles, such as socio-demographic characteristics (e.g., gender, age, education, and work experience; Nappo, 2019; Punzo, 2018).

Second, we found job compensation and rewards (i.e., economic remunerations, prospects for career advancement, job security, management, and social support) as one of the main factors of job satisfaction (Locke & Latham, 1990).

Third, we have found that working conditions, such as contractual arrangements (e.g. working hours, regular timetable, pace of work, quantity, or difficulty of work, among others), can affect the workers' feelings about their job, especially if there is a difference between the reality and the expected conditions (Nappo, 2019; Punzo, 2018).

Fourth, we observed a last variable, job control and work-life balance defined as the ability to schedule their own duties and find an equilibrium between personal and professional activities. This work-life balance seems to be more and more relevant due to the current employees' and society's demands (Cottini & Lucifora, 2013; Gomez-Baya & Lucia-Casademunt, 2018; Punzo et al., 2018).

2.4. Safety climate – Job satisfaction

We suggest that the perceptions of a better safety climate will make the employees realize that they are valued members of the organization, something that will be associated with high levels of job satisfaction. Therefore, by making the workers feel they are valuable participants in the company, it is reasonable to argue that job satisfaction is likely to influence an individual's motivation and behavior for improving safety performance (Goldenhar, Williams & Swanson, 2003; Punzo, 2018). This change of behavior can make a difference in making even extra efforts (Clarke, 2010).

There have been previous studies examining the relationship between safety climate and job satisfaction. For example, Balogun et al. (2020) tried to explain employee's turnover intention as a function of safety climate mediated by job satisfaction. Those authors found a significant and positive relationship between safety climate and job satisfaction. Hence, in the context of our model, we posit that safety climate will be positively related to job satisfaction, and therefore with its factors: working conditions, work-life balance, and job rewards and compensations. Consequently, we state our third hypothesis as follows:

H3. Safety climate has a positive and significant effect on job satisfaction variables.

H3a. Safety climate has a positive and significant effect on working conditions.

H3b. Safety climate has a positive and significant effect on working life balance.

H3c. Safety climate has a positive and significant effect on job rewards and compensations.

2.5. Job satisfaction – workers' health

At the same time, there is a direct relationship between job satisfaction and workers' health (Gomez-Baya & Lucia-Casademunt, 2018; Hünefeld et al., 2020; Roelen et al., 2008). In particular, there are studies that have analyzed the relationships between some specific job satisfaction factors, such as working conditions, with mental or physical health (Cottini & Lucifora, 2013; Nappo, 2019). In most of these studies, the authors found a positive relationship between job satisfaction and employees' optimal behavior in terms of safety (Gomez-Baya & Lucia-Casademunt, 2018; Nielsen et al., 2017). In this way, human resource managers can meet workers' basic needs to keep them satisfied and enhance favorable workers' behaviors (Edgar & Geare, 2005; Gomez-Baya & Lucia-Casademunt, 2018) because satisfied workers are more involved in their own duties, and this change in attitudes may reduce their exposure to risks, thereby improving workers' health (Gomez-Baya & Lucia-Casademunt, 2018; Nielsen et al., 2017).

So, we state our following hypotheses regarding job satisfaction. More specifically, job satisfaction factors will be positively associated with mental and physical workers' health.

H4. Working conditions have a positive and significant effect on workers' health.

H4a. Working conditions have a positive and significant effect on workers' mental health.

H4b. Working conditions have a positive and significant effect on workers' physical health.

H5. Work-life balance has a positive and significant effect on workers' health.

H5a. Work-life balance has a positive and significant effect on workers' mental health.

H5b. Work-life balance has a positive and significant effect on workers' physical health.

H6. Job rewards and compensation have a positive and significant effect on workers' health.

H6a. Job rewards and compensation have a positive and significant effect on workers' mental health.

H6b. Job rewards and compensation have a positive and significant effect on workers' physical health.

Up to this point, we have proposed a model to analyze whether safety climate is directly related to each of the three components of job satisfaction: working conditions, work-life balance, and job rewards and compensations (Hypothesis H3). Besides, we have proposed to check whether safety climate positively affects physical and mental health (Hypothesis 2). Additionally, we have proposed if working conditions, work-life balance, and job rewards and compensations may affect workers' health (Hypotheses H4-H5-H6).

2.6. Mediation role of job satisfaction

According to Clarke (2010), companies with a higher level of safety climate can have their employees more satisfied as they can feel more valued by their companies. These workers will improve their attitudes if they are satisfied with their jobs (Huang et al., 2016). This change in behavior can lead to fewer health problems (Gomez-Baya & Lucia-Casademunt, 2018). Clarke (2010) stated the mediating role of job satisfaction in the relationship between safety climate and safety behavior in her model to explain occupational accidents. Gomez-Baya and Lucia-Casademunt (2018) analyzed the mediation role of job satisfaction in the relationship between workers' psychological needs and mental problems, considering the possibility of a total or partial mediation effect. Consequently, we want to check whether the relationship between safety climate and workers' health is mediated by job satisfaction decomposed into its three factors. In this regard, we explore the possibility of a total mediation (i.e., if safety climate affects workers' health only through their influence on the components of job satisfaction) or a partial mediation (i.e., if safety climate presents also a direct effect on workers' health).

The statement of the mediation hypotheses is as follows:

H7. Safety climate significantly affects workers' health through its effect on job satisfaction variables.

H7a. Safety climate significantly affects workers' mental health through working conditions.

H7b. Safety climate significantly affects workers' physical health through working conditions.

H7c. Safety climate significantly affects workers' mental health through work-life balance.

H7d. Safety climate significantly affects workers' physical health through work-life balance.

H7e. Safety climate significantly affects workers' mental health through job rewards and compensations.

H7f. Safety climate significantly affects workers' physical health through job rewards and compensations.

Considering all the hypotheses indicated above, our complete model can be seen in Fig. 1.

3. Methodology, sample, and data.

3.1. Sample and data

We have used secondary data from the latest wave of the European Working Conditions Survey (6th EWCS, 2015) in our empirical analyses to investigate the links between safety climate and workers' health. The complete sample includes 35 countries, including the EU28, Norway, Switzerland, Albania, the former Yugoslav Republic of Macedonia, Montenegro, Serbia, and Turkey. The survey provides a detailed picture of the working conditions and attributes in Europe across countries, industries, occupations, genders, and age groups.

Eurofound provides an exhaustive description of the survey design and data, which is available on the website of the UK data service. The questionnaire includes 106 questions covering a wide range of issues related to employment status, work organization, training, physical and psychosocial hazards exposures, health and safety, job demands, work organization practices, work-life balance, worker participation in company's decisions, type of contract, earnings and financial security. We focus our study on the construction sector in Spain. The sample of Spanish construction workers was composed by all random observations contained in the EWCS of all workers in the Spanish sector, totaling 232 workers. Since the total population of Spanish construction workers was 1.058.500 (INE, 2015), the sample error of our final sample was 6.43 % with 95 % of statistical confidence (Del Castillo, 2008).

The demographic characteristics of our sample are as follows: the mean of workers' age was 42 years (s.d. = 10.30; min 17, max 63), with 214 men (92.24 %) and 18 women (7.76 %). Among the total number of workers, 186 (80.17 %) had no employees under their supervision, while 46 had at least one employee under their supervision, on whom their pay increases, bonuses, or promotions depended directly.

In terms of company size, 38 respondents were self-employed, 102 worked in micro-companies (with up to 9 workers), 60 in small or medium companies (between 10 and 249 workers), 17 in large companies (more than 250 workers), and 15 respondents did not answer this question.

Descriptive analyses were performed using STATA, and the model analysis was carried out using SmartPLS v.3 software (Ringle, Wende, & Becker, 2015). Partial least squares structural equation modelling (PLS-SEM) was used to assess the quality of the measurement instrument and the hypotheses of the proposed model. PLS-SEM is a particularly appropriate method when small samples are used and when the normality of the data is not assumed (Hair et al., 2012). In the present study, it was impossible to ensure that the data obtained were normally distributed using the Shapiro-Wilk normality test and the Kolmogorov-Smirnov test. Therefore, it was appropriate to use the SmartPLS3 software (Ringle et al., 2015). The stability of the estimates was confirmed by bootstrapping (5000 subsamples), with two-tailed tests, and at a significance level of 0.05.

3.2. Variables

3.2.1. Dependent variables

The main dependent variables in our proposed theoretical model are mental and physical health. Both are subjective indicators of health that were collected through individual responses in the survey (all the items included in these variables can be seen in Appendix A). We posit that safety climate is directly related to workers' health and mediated by working conditions, work-life balance, and job rewards and compensations, which are the three variables capturing job satisfaction.

Regarding mental health and physical health latent variables, formative factors were considered. That is, the indicators and the construct have inverted causal relationships assuming that the observed indicators cause the latent variable, and they cannot be replaced or exchanged (Hair et al., 2014).

Mental health refers to emotional and psychological well-being. In the literature, we found some indicators for general and specific mental health trying to capture whether or not the work can cause employees' mental problems such as stress, fatigue, sleeping problems, anxiety, and irritability (Cottini & Lucifora, 2013). From EWCS we have included all these indicators of mental problems measured on a 5-point Likert-type scale from one (very good), two (good), three (acceptable), four (bad), to five (very bad).

Physical health refers to physical injuries or problems such as skin problems, backache, and muscular pains in the upper or lower limbs. All the responses in the EWCS related to this type of health problems were expressed with 'yes' or 'no.'.

3.2.2. Explanatory variables

The model in this study includes four main exploratory latent variables: safety climate, working conditions, work-life balance, and job rewards and compensations. These reflective latent variables are inferred from observed indicators, which are caused by the underlying unobservable variable. Detailed indicators and construct can be found in Appendix A.

3.2.2.1. Safety climate. As previously mentioned, the safety climate variable comprises six latent variables: management commitment, employee involvement, safety communication, risk appraisal and risk-taking, management support, and psychological capital. Items for each variable were sourced from the European Working Conditions Survey (EWCS), focusing on aspects related to safety management and performance. Each latent variable was measured using a 5-point Likert-type scale. The precise measurement of each factor, as well as the items and measures, can be found in Appendix A. One contribution of this study is to establish a replicable measurement model that allows for comparability across different studies, countries, and sectors.

3.2.2.2. Job satisfaction: Working conditions, work-life balance, and job rewards and compensation. Job satisfaction in this study is captured through three endogenous variables: working conditions, work-life balance, and job rewards and compensations, while individual characteristics serve as a control variable. Each variable is measured using a 5-point Likert-type scale.

(a) Working Conditions

Working conditions encompass hours worked per week, work pace, and disturbing situations at work. This variable aims to assess the impact of the work environment on workers' satisfaction and health.

(b) Work-Life Balance

Work-life balance reflects the equilibrium between personal and work life. While not commonly included in construction sector studies, it is well-recognized in other sectors and can significantly impact job satisfaction and workers' health.

(c) Job Rewards and Compensation

This variable comprises respondents' perceptions of manager recognition and support, colleagues' recognition, prospects for career advancement, and the equity of labor incomes. It evaluates the impact of monetary and non-monetary rewards on job satisfaction and workers' health.

4. Results

4.1. Common method bias

The data were collected from the same source through an identical collection method, so common method bias (CMB) may be a potential problem (Podsakoff et al., 2003). First, a confirmatory factor analysis (CFA) Harman's single-factor model test was conducted and followed by an unmeasured latent variable test (Markel & Frone, 1998). If a single item has a total variance greater than 50 % it can introduce CMB into the data and empirical conclusions (Podsakoff et al., 2003). In the study, the total variance of a single factor was 21.95 %, and the evaluation of all factors introduced in the model leads to 42.74 % explained variance. This suggests that CMB should not be a problem for this data set (Molinillo et al., 2021).

4.2. Evaluation of the measurement model

Table 2 shows the results of construct reliability and convergent validity assessments.

Some items were removed from the factors due to their factor loadings did not exceed the value of 0.7 (see Appendix B) and some items were excluded from the model because they cannot be re-coded in a 5-Likert scale response. In contrast to Punzo et al's (2018) study, we have not directly included the items related to individual characteristics such as gender, age, and human capital (seniority, level of education) due to their answers were not measured on a 5-Likert scale. We propose to use them in our model as control variables to assess if there are differences in the model at the measurement and structural level.

All the latent variables of the theoretical model to be tested were reflective, except for the case of the endogenous latent variables (mental health and physical health). To unequivocally verify this statement, a theoretical analysis was carried out on the meaning of such relationships between the indicators and the endogenous latent construct of the study. Also, a quantitative analysis based on the confirmatory tetrad analysis in PLS (CTA-PLS) (Hair et al., 2018) was carried out (Hair et al., 2018). Finally, it was found that the mental health (MH) and physical health (PH) variables were formative.

Both Cronbach's alpha (CA) and the composite reliability (CR) of the different latent variables exceeded in all cases the minimum value of 0.8 suggested by Nunnally (1978). In addition, to assess the collinearity of the inner model, Variance Inflation Factor (VIF) was used, obtaining values lower than 5 in all cases, so there was no collinearity problem (Hair et al., 2011). As for the analysis of average variance extracted (AVE), the minimum recommended level of 0.5 was exceeded for all the latent constructs incorporated into the theoretical model (Fornell & Larcker, 1981).

Three valid PLS-SEM methods were followed to test discriminant validity: (i) loading coefficients should be greater than the cross-loadings; (ii) inter-construct correlations should be less than the square root of the AVEs (Table 3); (iii) the heterotrait-monotrait ratio (HTMT) should be less than 1 (Table 3).

Finally, concerning the evaluation of the measurement model, all values were found to be below the maximum recommended thresholds. Therefore, the results supported the consideration of the reliability and

Table 2
Variable descriptive statistics, reliability, and convergent validity.

Constructs	Items	M	SD	Weight	Loading	VIF	CA	rho_A	CR	AVE
Management Commitment (MC)							0.852	0.853	0.910	0.771
	MC11	1.815	1.093	0.361***	**0.862*****					
	MC12	2.034	1.178	0.387***	**0.895*****					
	MC13	2.082	1.231	0.390***	**0.878*****					
Employee Involvement (EE)							0.817	0.819	0.872	0.577
	EE11	2.487	1.793	0.265***	**0.714*****					
	EE12	2.216	1.341	0.268***	**0.776*****					
	EE13	2.560	1.513	0.197***	**0.782*****					
	EE14	2.608	1.401	0.297***	**0.813*****					
	EE15	2.108	1.362	0.293***	**0.706*****					
Safety Communications (SC)							0.554	0.572	0.767	0.528
	SCOM11	2.200	1.466	0.543***	**0.728*****					
	SCOM12	2.265	1.770	0.482***	**0.836*****					
	SCOM13	1.956	1.707	0.339***	**0.596*****					
Risk Appraisal and Risk-Taking (RA)							0.860	0.876	0.895	0.587
	RA11	3.086	1.764	0.168***	**0.722*****					
	RA12	2.737	0.644	0.238***	**0.819*****					
	RA13	2.944	1.600	0.192***	**0.773*****					
	RA14	2.483	1.567	0.205***	**0.708*****					
	RA15	3.263	1.721	0.297***	**0.761*****					
	RA16	3.147	1.680	0.205***	**0.806*****					
Management Support (MS)							0.890	0.895	0.919	0.695
	MS11	1.541	1.041	0.228***	**0.800*****					
	MS12	2.400	1.477	0.214***	**0.776*****					
	MS13	2.188	1.659	0.235***	**0.836*****					
	MS14	1.924	1.260	0.265***	**0.873*****					
	MS15	2.159	1.461	0.255***	**0.880*****					
Psychological Capital (PC)							0.862	0.865	0.901	0.646
	PC11	2.013	0.848	0.248***	**0.812*****					
	PC12	2.125	0.932	0.258***	**0.844*****					
	PC13	2.060	0.931	0.258***	**0.852*****					
	PC14	2.228	0.985	0.212***	**0.772*****					
	PC15	2.022	0.971	0.270***	**0.731*****					
Working Conditions (WC)							0.632	0.656	0.843	0.729
	WC11	1.642	1.244	0.652***	**0.890*****					
	WC12	2.043	1.420	0.515***	**0.816*****					
Work-Life Balance (WLB)							0.577	0.724	0.760	0.521
	WLB11	2.677	1.397	0.317***	**0.601*****					
	WLB12	2.478	1.511	0.308***	**0.650*****					
	WLB13	2.030	1.582	0.690***	**0.883*****					
Job Rewards and Compensations (JRC)							0.551	0.614	0.810	0.683
	JR11	3.009	1.613	0.720***	**0.899*****					
	JR12	3.573	1.931	0.472***	**0.746*****					
Mental Health (MH)(Composite model. Mode B)										
	MH11	1.815	1.093	**0.111*****	0.393***	2.376				
	MH12	2.034	1.178	**0.025*****	0.350***	2.441				
	MH13	2.082	1.231	**0.038*****	0.454***	2.106				
	MH14	3.112	1.328	**−0.899*****	−0.969***	1.137				
	MH15	3.004	1.547	**0.178*****	0.334***	1.063				
Physical Health (PH) (Composite model. Mode B)										
	PH11	1.431	0.495	**0.138*****	0.705***	1.939				
	PH12	1.461	0.498	**0.621*****	0.861***	2.527				
	PH13	1.388	0.487	**0.118*****	0.670***	1.886				
	PH14	1.073	0.261	**−0.222**	0.011	1.101				
	PH15	1.043	0.203	**0.168**	0.311*	1.041				
	PH16	1.323	0.468	**0.287*****	0.601***	1.198				
	PH17	1.056	0.230	**0.200*****	0.328***	1.096				

Note. M = Mean; SD = Standard deviation; VIF = Variance Inflation Factor; CA = Cronbach's alpha; CR = Composite reliability; AVE = Average variance extracted; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, one-tailed test; n = 5000 subsamples. * 95 % confidence level – two tailed.

validity of the measures used. Thus, it could be affirmed that the structural model is suitable for analysis.

4.3. Models comparison

Many studies suggested that safety climate is a multidimensional concept and comprises specific dimensions that are correlated, so it is convenient to consider the construct as a second-order factor (Chen et al., 2005).

Regarding hypothesis 1a, the six distinct but related subdimensions of safety climate can be explained by a common underlying higher-order factor model of safety climate that is significantly better than a first-order factor model.

Therefore, once the reliability and validity of the first-order factor measures were established, the performance of the second-order factor model of safety climate was evaluated. In accordance with the recommended procedures for testing second-order factor models (Rindskopf & Rose, 1988), we followed a hierarchical approach in which five models were developed.

The M1 model is a first-order factor model with five separate, uncorrelated safety climate factors, excluding psychological capital (Fig. 2a). The M2 model is similar to M1 but includes psychological capital (Fig. 2b). Both models have suboptimal fit indices (Table 4). M3 model consists of five correlated safety climate dimensions without

Table 3
Discriminant validity.

	(EI)	(JR)	(MC)	(MS)	(PC)	(RA)	(SC)	(SCOM)	(WC)	(WLB)
EMPLOYEE INVOLVEMENT (EI)	***0.760***	0.363	0.315	0.364	0.267	0.223	0.716	0.397	0.214	0.213
JOB REWARDS AND COMPENSATIONS (JR)	0.261	***0.826***	0.653	0.406	0.401	0.292	0.644	0.614	0.420	0.268
MANAGEMENT COMMITMENT (MC)	0.273	0.454	***0.878***	0.562	0.478	0.108	0.784	0.986	0.226	0.251
MANAGEMENT SUPPORT (MS)	0.317	0.292	0.490	***0.834***	0.327	0.165	0.809	0.978	0.157	0.250
PSYCHOLOGICAL CAPITAL (PC)	0.231	0.299	0.414	0.293	***0.804***	0.147	0.723	0.486	0.276	0.446
RISK APPRAISAL AND RISK-TAKING (RA)	0.199	0.217	0.087	0.148	0.128	***0.766***	0.606	0.163	0.419	0.417
SAFETY CLIMATE (SC)	0.561	0.471	0.741	0.790	0.654	0.388	***0.509***	0.959	0.409	0.493
SAFETY COMMUNICATION (SCOM)	0.269	0.330	0.642	0.685	0.324	0.112	0.720	***0.822***	0.193	0.319
WORKING CONDITIONS	0.168	0.231	0.165	0.120	0.202	0.316	0.279	0.112	***0.854***	0.358
WORK-LIFE BALANCE (WLB)	0.101	0.180	0.180	0.200	0.321	0.364	0.349	0.183	0.228	***0.722***

Note. The square roots of the AVEs are in italics and bold on the main diagonal. The Fornell-Larcker criterion is depicted below the main diagonal. The heterotrait-monotrait (HTMT) ratio is above the main diagonal.

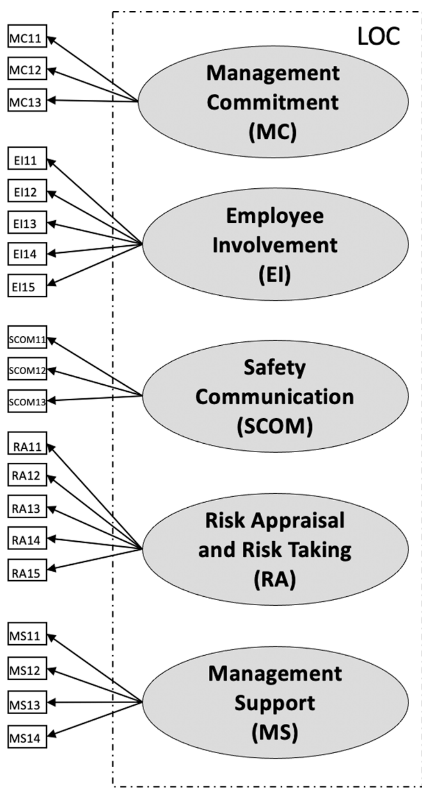


Fig. 2a. Model 1. Five first-order uncorrelated factors.

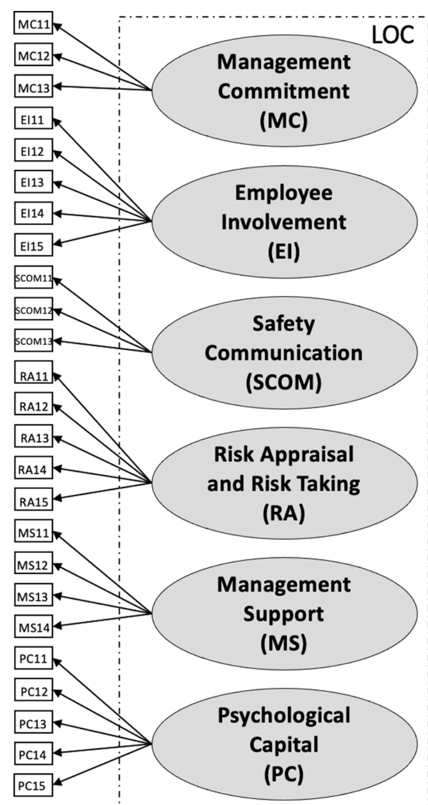


Fig. 2b. Model 2. Six first-order uncorrelated factors.

psychological capital or a second-order factor (Fig. 2c). M4 model replicates M3, but includes psychological capital (Fig. 2d), with acceptable fit indices (CFI = 0.875; TLI = 0.859; RMSEA = 0.071; SRMR = 0.086; χ^2/df = 2.174). Lastly, the M5 model features safety climate as a second-order factor with six first-order factors (Fig. 2e), showing slightly better fit indices than M4 (CFI = 0.902; TLI = 0.902; RMSEA = 0.066; SRMR = 0.087; χ^2/df = 2.0109). Considering the results obtained, we retained the M5 model as the most appropriate and examined its performance in the global measurement model and in the structural model.

The full measurement model, which included the second-order factor model of safety climate, was further tested for reliability and validity. Reliability was assessed by analyzing the composite reliability and average variance extracted (AVE) values.

4.4. Power analysis

Prior to the structural model was analyzed, G*Power was used to determine whether the sample used met the minimum threshold required (Hair et al., 2016). The power analysis was conducted using the heuristic rules of Cohen's power tables and the square root method (Cohen, 1988; Faul et al., 2009). The minimum required sample was 161 individuals, to obtain a power value of 0.99. Therefore, this result confirms that our sample, composed of 232 individuals, substantially exceeds the minimum required observations to be able to apply correctly the PLS-SEM method.

4.5. Evaluation of the structural model

With the evaluation of the structural model, the significance of the hypothesized relationships was analyzed, as well as the predictive relevance of the proposed model. First, a bootstrapping procedure was carried out with 5,000 subsamples to evaluate the significance of the coefficient paths (Hair et al., 2011). As shown in Table 5, most of the model hypotheses received empirical support in terms of direct effects, except H4a, H4b, and H6b.

The values of the predictive capacity of the model are also shown in Table 5. Specifically, the R^2 values for each variable exceed the

Table 4
Model comparison.

Fit Indices	Single first order factor (M1)	Single first-order factor (M2) including psychological Capital	Correlated first-order factors (M3)	Correlated first-order factors + adding Psychological Capital (M4)	Six Correlated first-order factors, one second-order factor (M5)
χ^2	1327.20	1895.64	499.50	671.78	589.22
CFI	0.52	0.46	0.87	0.88	0.90
TLI	0.46	0.42	0.85	0.86	0.89
RMSEA	0.15	0.14	0.08	0.07	0.06
SRMR	0.20	0.17	0.09	0.08	0.08
χ^2/df	6.35	5.85	2.51	2.17	2.01

Notes: CFI - Comparative Fit Index; TLI - Tucker Lewis Index; IFI - Incremental Fit Index; RMSEA - Root Mean Square Error of Approximation; SRMR - Standardized Root Mean Square Residual.

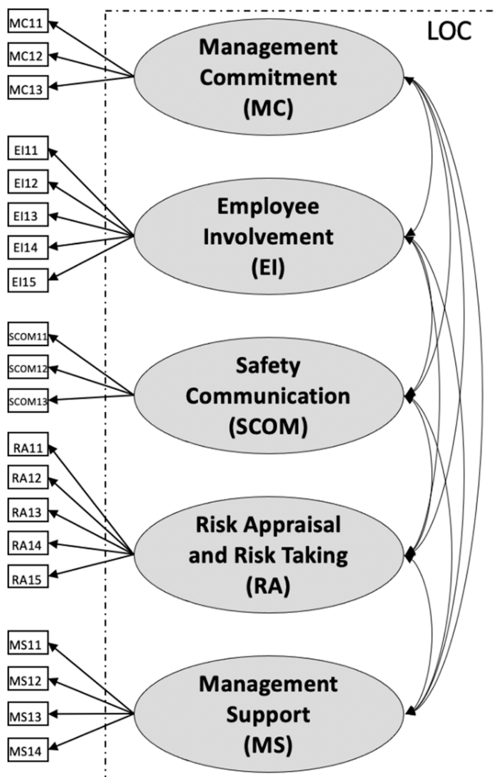


Fig. 2c. Model 3. Five correlated first-order factors.

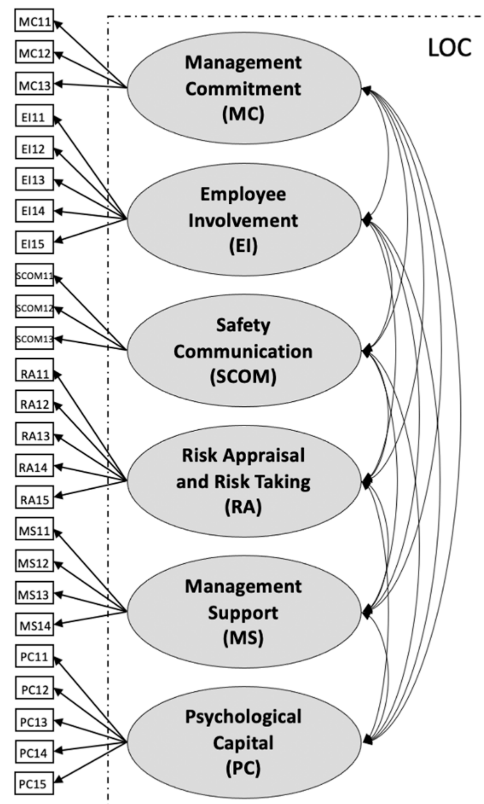


Fig. 2d. Model 4. Six correlated first-order factors.

minimum of 0.1 (Falk & Miller, 1992). The model explained a large part of the variance of the endogenous latent variables: mental health (76.5 %) and physical health (22.8 %). In addition, although to a lesser extent, the model also explained the latent constructs of job rewards and compensations (22.55 %), work-life balance (12 %), and working conditions (7.7 %).

The predictive capacity of the dependent constructs and endogenous variables was also estimated using the Q^2 test and the blindfolding procedure (omission distance = 7) (Geisser, 1975; Stone, 1974). At all times, the results obtained were greater than 0, so the proposed model presented predictive relevance.

4.6. Findings

According to the literature that argued safety climate is a multidimensional construct, we hypothesized that the six factors of safety climate can be accounted for by a common underlying second-order safety climate factor model, which is significantly better than a first-order safety climate factor model. Basing ourselves on the empirical results of models' comparison (Table 4), hypotheses 1a and 1b obtained sufficient empirical support. In this case, the model estimation reveals that the high-order construct, Safety Climate, has a strong relationship with its low-order constructs. Furthermore, in Fig. 3 is shown that significant relationships ($p < 0.001$) were found for each proposed factor to construct safety climate. The strongest effect on safety climate was found in management commitment (MC) ($\beta 1a = 0.778$, $p < 0.001$), followed by safety communication (SCOM) ($\beta 1c = 0.775$, $p < 0.001$), risk appraisal and risk-taking (RA) ($\beta 1d = 0.773$, $p < 0.001$), psychological capital (PC) ($\beta 1f = 0.655$, $p < 0.001$) has the fourth biggest effect in explaining safety climate, above employee involvement (EI) ($\beta 1b = 0.546$, $p < 0.001$), and finally management support (MS) ($\beta 1e = 0.363$, $p < 0.001$).

Regarding the second hypothesis, the results provided strong and significant support to the positive and direct effect of safety climate on mental and physical workers' health. Safety climate was significantly correlated with mental health variables (H2a) and physical health (H2b). So, the higher the level of safety climate the better the workers' health.

Furthermore, the results allow us to conclude that safety climate has a strong effect on job rewards and compensations ($\beta 3c = 0.474$, $p < 0.001$), followed by work-life balance ($\beta 3b = 0.347 p < 0.001$) and

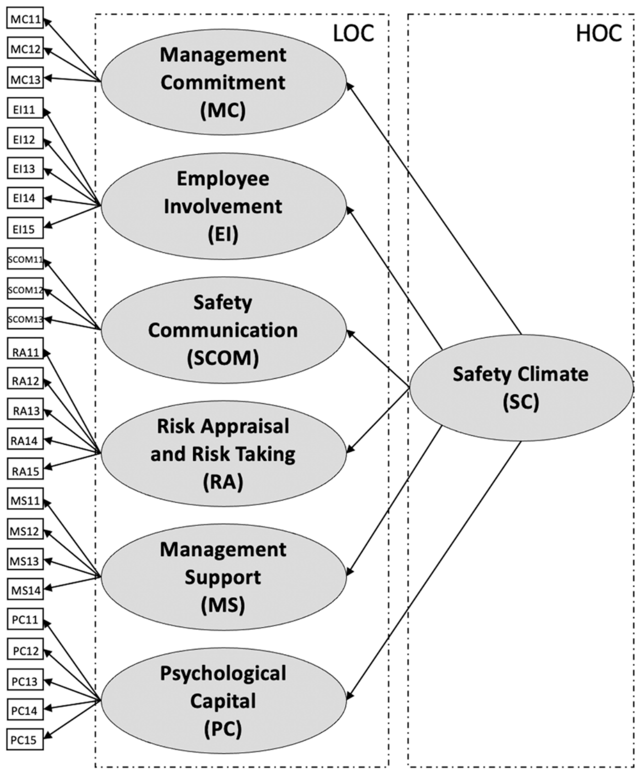


Fig. 2e. Model 5. Six first-order factors, one second-order factor.

working conditions ($\beta 3a = 0.278$, $p < 0.001$), thus, consistent with our third hypothesis.

In terms of direct effects, the mental health construct is mainly explained by the variables work-life balance ($\beta 5a = 0.813$, $p < 0.001$), job rewards and compensations ($\beta 6a = 0.165$, $p < 0.001$), and safety climate ($\beta 2a = 0.163$, $p < 0.001$). While the physical health variable is explained by the variables work-life balance ($\beta 5b = 0.287$, $p < 0.001$) and safety climate ($\beta 2b = 0.177$, $p < 0.05$). So, we can state that our fifth hypotheses (5a - work-life balance effect on mental health, and 5b work-life balance effect on physical health) were supported.

Hypotheses 4 proposed that working conditions affected mental health (4a) and physical health (4b). These relationships were not supported as we obtained non-significant coefficients ($p > 0.05$). This result is unexpected because the majority of the considered literature confirmed this relationship (Gomez-Baya & Lucia-Casademunt, 2018; Nappo, 2019). Different explanations for these results will be discussed in the next section.

Regarding H6, which stated the direct effect of job rewards and compensations on mental health (H6a) and physical health (H6b), we found support for H6b, that is, job rewards and compensations have a positive and significant effect on physical health ($\beta 6b = 0.165$, $p < 0.001$). Contrary to what we expected according to our hypothesis, we have not found significant support for the relationship between job rewards and compensations and mental health. The coefficient was negative but not significant ($\beta 6a = -0.050$, $p > 0.05$) (see Fig. 3).

4.7. Mediation analysis

About the mediation analysis (Hypotheses 7) of the dominant variables working conditions, work-life balance, and job compensation and rewards, the significant analysis of direct and indirect effects revealed the existence of complementary mediation only in the case of work-life balance. The significance analysis of direct and indirect effects revealed only the presence of complementary mediation for the work-life balance case since both direct and indirect effects were significant and positive in both cases. Therefore, our results provide empirical support for the mediating role of work-life balance in the workers' health patterns. More specifically, work-life balance represents a mechanism underlying the relationship between safety climate and mental or physical health. Safety climate leads to work-life balance, and this, in turn, leads to mental and physical health (see Table 5).

Once the significance of the indirect effects has been established, the mediation's strength can be examined by using the total effects and the variance account for (VAF). Thus, the VAF indicates that 65.8 % of the effect of safety climate on mental health is through work-life balance as a mediator, and the magnitude is considered partial. At the same time, the effect of safety climate on physical health is produced through work-

Table 5
Significance analysis of the direct and indirect effects.

Supported	No mediation	No mediation	Partial mediation	Partial mediation	No mediation	No mediation
VAF (indirect effect/total effect)	–	–	0.658	0.370	–	–
Significance (p > 0.05)	NO	NO	YES	YES	NO	NO
T - value	0,39	0,269	5.284	3.314	1.099	1,875
95 % confidence interval of the Indirect Effect	[-0.014, 0.027]	[-0.048,0.061]	[0.173, 0.379]	[0.044, 0.162]	[-0.072, 0.013]	[0.008, 0.0176]
Indirect Effect	0.004 SAFETY CLIMATE → **WORKING CONDITIONS →** MENTAL HEALTH	0.007 SAFETY CLIMATE → **WORKING CONDITIONS →** PHYSICAL HEALTH	0.277 SAFETY CLIMATE **→ WORK-LIFE BALANCE →** MENTAL HEALTH	0.107 SAFETY CLIMATE **→ WORK-LIFE BALANCE →** PHYSICAL HEALTH	−0.023 SAFETY CLIMATE → JOB **REWARDS AND COMPENSATION →** MENTAL HEALTH	0.004 SAFETY CLIMATE → **REWARDS AND COMPENSATION →** PHYSICAL HEALTH
Significance (p < 0.05)	YES	YES	YES	YES	YES	YES
t value	2.789	8.939	2.789	8.939	2.789	8.939
95 % confidence Interval of the Direct Effect	[0.059, 0.285]	[-0.036, 0.361]	[0.059, 0.285]	[-0.036, 0.361]	[0.059, 0.285]	[-0.036, 0.361]
Direct Effect	0.163 SAFETY CLIMATE → MENTAL HEALTH	0.177 SAFETY CLIMATE → PHYSICAL HEALTH	0.163 SAFETY CLIMATE → MENTAL HEALTH	0.177 SAFETY CLIMATE → PHYSICAL HEALTH	0.163 SAFETY CLIMATE → MENTAL HEALTH	0.177 SAFETY CLIMATE → PHYSICAL HEALTH
Hyphotesis	H7a	H7b	H7c	H7d	H7e	H7f

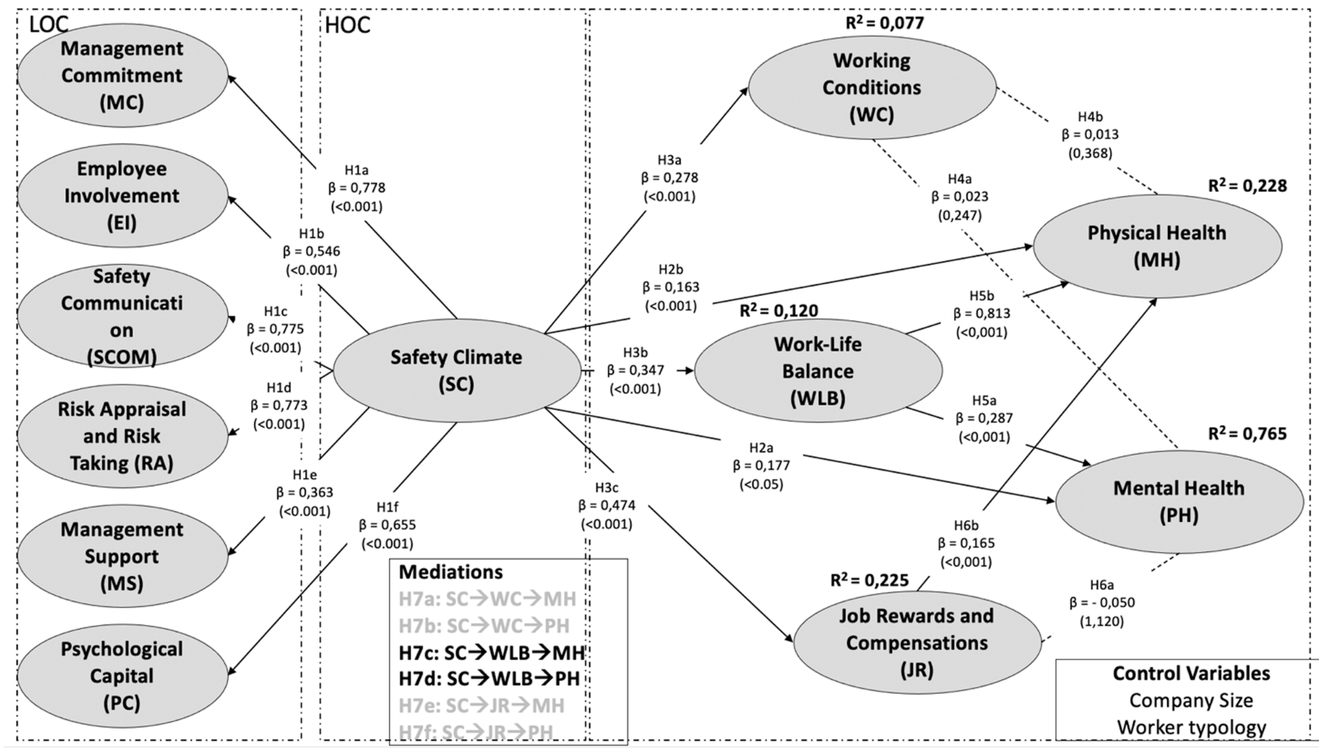


Fig. 3. Model.

life balance as a partial mediator.

4.8. Importance-Performance analysis (IPMA)

The IPMA contrasts structural model total effects on a specific endogenous latent variable with the average latent variable scores of this construct's predecessors. The total effects represent the predecessor constructs' importance in shaping the target construct, while their average latent variable scores represent their performance. Hence, the goal is to identify predecessors with strong significance for the target construct and relatively low performance, underlying potential areas of improvement that may receive more attention (Hair et al., 2014).

According to the results of the IPMA reported in Table 6, if we wish to increase the mental health of the workers, we should focus mainly on the work-life balance, and then on safety climate, since there is still room for improvement in terms of their performance. Similarly, in the case of physical health, safety climate variable has a significant effect, but its performance can be improved, as well as the work-life balance variable, which is below the performance obtained by job rewards and compensation.

4.9. Individual characteristics control

We have controlled by individual characteristics such as worker typology (if they have some workers under their supervision or not), and the size of the company. On the one hand, there is low variability in most individual characteristics (gender, level of education, current situation, type of contract, and sector. This homogeneity in the data limits the possibility to control by these characteristics. In this case, it could be a possibility to increase the size of the sample to have more representability of each characteristic group. On the other hand, we have controlled by company's size and we have not found significant differences.

5. Discussion

This research studies the relationship between a multidimensional safety climate and workers' health mediated by working conditions, work-life balance, and job rewards and compensations. The results confirmed most of the relationships proposed in our theoretical model.

First, as discussed in the literature review, safety climate is not a single dimension variable (Zohar, 2000; 2014). According to the studies reviewed, there are a multitude of different factors across alternative models to measure safety climate (see Table 1). This lack of consistency in which factors must be considered in the models to measure safety climate can be due to the variety of questionnaires, samples and methodologies used by researchers (Choudhry et al., 2009). One of the aims of this study is to propose a model for measuring safety climate using the information and data from a publicly available survey (the EWCS). Another objective of our research is to incorporate in the measurement model the key variable of psychological capital, which has been suggested by some authors (Bamel et al., 2020) but omitted until now in

Table 6
Importance-Performance Analysis (IPMA).

	IMPORTANCE	PERFORMANCE	IMPORTANCE	PERFORMANCE
	MENTAL HEALTH (MH)		PHYSICAL HEALTH (PH)	
SAFETY CLIMATE (SC)	0.464	19.900	0.415	19.900
WORKING CONDITIONS	0.003	14.567	0.020	14.567
WORK-LIFE BALANCE (WLB)	0.807	26.671	0.269	26.671
JOB REWARDS AND COMPENSATIONS (JR)	−0.047	29.228	0.251	29.228

previous models. As we explained above, we have not included some items from the European working condition survey due to the impossibility to re-code them into a 5-points Likert-scale. Therefore, an additional goal of our study is to reframe some questions of the survey to be answered in such a scale, with the intention of reinforcing the reliability and validity of the working conditions factor (See Appendix C).

In the context of safety climate, we have considered the more salient factors proposed in the literature. After fitting our structural model, the results show that all the factors considered are significant in the explanation of safety climate, although the relative importance of the factors by their effect size is somewhat different from other previous studies (Choudhry et al., 2009; Schwatka, 2016; Zohar, 1980).

Our results show that safety climate is mainly explained by management commitment. This is consistent with previous studies that argue this is a core factor to achieve a good safety climate (Ajslev et al., 2017; Chan et al., 2017; Choudhry et al., 2009; Fang et al., 2006; Kim et al., 2021; Lingard et al., 2012; Mosly, 2019; Niu et al., 2016; Schwatka et al., 2016; Zhou et al., 2015). The second most important factor (as per its effect size) explaining safety climates is safety communication, a result that is also in line with other previous studies (Chan et al., 2017; Choudhry et al., 2009; Kim et al., 2021; Niu et al., 2016; Schwatka et al., 2016). Management commitment and safety communication can be viewed as organizational factors, reflecting the importance of the manager's attitude toward safety issues and how it affects workers' perceptions of the relevance of safety within the company.

The three following factors in terms of their effect size on safety climate, which can be interpreted as individual factors, are: risk appraisal and risk-taking, psychological capital, and employee involvement. Our results for risk appraisal and risk-taking show that this factor is important to get a good safety climate, this result is consistent with findings from other studies (Chan et al., 2017; Fang et al., 2006; Kim et al., 2021; Niu et al., 2016; Wang et al., 2018; Zhou et al., 2015), and the same for employee involvement (Ajslev et al., 2017; Choudhry et al., 2009 Lingard et al., 2012; Mosly, 2019; Schwatka et al., 2016). As we have already mentioned, to the best of our knowledge, this is the first empirical measurement of safety climate that incorporates the psychological capital factor, and moreover in the construction sector. The previous most relevant five factors that we have discussed above, which belong to organizational and individual levels, reflect that safety climate will depend on all agents involved in the effective work organization (managers) and the appropriate work performance (workers). Thus, managers can act by improving interactions between colleagues and empowering workers, providing them with training and giving them more control and responsibility over their work and decision-making (Arocena et al., 2008). Concerning psychological capital, we highlight the need of considering and appreciating the workers' feelings and motivations, in order to raise the workers' commitment and improve their performance.

The last important factor in terms of its effect size on safety climate is management support. As stated in some studies, the support received from management has an effect on workers' safety perceptions (Ajslev et al., 2017; Kim et al., 2021). It should be noted that in some of the reviewed studies, management support is included in a broad factor that includes several organizational aspects, such as encouraging their employees to work safely rather than pressuring them to work fast (Ajslev et al., 2017), while in other studies it is considered an independent factor that refers to the extent to which managers provide resources, recognition, and encouragement to workers to promote safety (Kim et al., 2021). One reason for these different approaches to safety support may depend on the predominant size of the companies in the sample being studied and whether the focus is on managers' or workers' feelings. In our model, management support refers to workers' perceptions of a supportive environment and recognition for doing a safe and good job. We believe that the process of this recognition is more direct in small and medium-sized enterprises (SMEs) because of the closer relationship between workers and managers, considering that 99.97 % of construction companies in Spain and the EU are small and medium-sized enterprises (SMEs), that is, they have less than 50 employees (INE, 2019).

Therefore, the company's resources and efforts in the construction sector should follow this sequence to improve the safety climate when resources are limited. Managers can significantly improve the safety climate in their companies by being committed to their role as managers in terms of effective work organization, trusting their employees, setting an example of integrating safety into the company, valuing their employees' safe behavior, getting people to work together, ensuring fluid communication among all employees, or positively valuing their employees' attitudes, among other actions.

Concerning workers' health, we found that mental and physical health are influenced by several factors, such as safety climate, work-life balance, and job rewards and compensations mainly.

Specifically, the critical factors affecting mental health were work-life balance and safety climate. This result is consistent with the findings of other studies (Cottini & Lucifora, 2013; Gomez-Baya & Lucia-Casademunt, 2018; Punzo et al., 2018). These factors, or any of their components, have been shown to be important in the final health outcomes of workers.

As for physical health, we found that work-life balance is the most crucial factor, followed by job rewards and compensation, and safety climate. In addition to the factors influencing mental health, in the case of physical health, all components of job rewards and compensation should also be considered. That is economic rewards, career advancement opportunities, job security, and management and social support. This finding is consistent with what Locke and Latham (1990) found by studying how all these components affect job satisfaction in predicting individual job performance and organizational goals attainment. Additionally, Nappo (2019) also confirmed a positive effect of job support on workers' physical health. Our findings imply that human resource managers must emphasize workers' work-life balance to improve their overall health, as this aspect affects both mental and physical health. Therefore, it is important to implement a set of interventions in the organization to improve the balance between employees' personal and professional activities. These activities could be empowering workers to self-manage the organization of their own tasks, designing flexible working hours, or avoiding the assignment of stressful workloads.

Contrary to what other studies have found, our results suggest that there is not a significant direct relationship between working conditions and workers' health (hypotheses 4a mental health and 4b physical health). Specifically, Punzo et al.'s (2018) results confirmed a significant effect of working conditions on mental health and Nappo's (2019) ones on physical health. Our divergent result could be explained by the lower capability to measure working conditions with the items available in the survey we have used (EWCS). This factor was one of the most affected when the measurement model of latent variables was determined. There were many questions of the survey regarding working conditions that had to be removed as, for example, working hours, pace of work, quantity and difficulty of work, because all of them were coded as numerical or dichotomous. For future studies, we offer in Appendix C a proposal to include some of these items measured in a 5-Likert scale to be included into a model similar to ours. It is likely that the results of the relationship between working conditions and workers' health would be different if all these missed items would be considered.

Another important finding of our research shows that work-life balance significantly mediates the relationship between safety climate and mental and physical health. This means that if the workers' perception of work-life balance is low, it can impact negatively their mental and physical health, even when the safety climate is adequate. Therefore, human resource managers should not only focus on generating a good safety climate to improve their workers' health. It would be also critical for them to understand the needs of their workers in terms of work-life balance. The combination of both factors will raise the effectiveness of managerial actions intended to improve workers' health.

As we have already stated, in order to explore the mediator effect of job satisfaction on workers' health results, we have explicitly introduced in our model three of the factors proposed by Punzo et al. (2018) to proxy job satisfaction, let's say, working conditions, work-life balance, and job rewards and compensation. The factors proposed as control variables were those related to individual characteristics (age, gender, education, seniority, activity details, type of contract, company size, etc.). We did not observe much variability in many of the individual characteristics because our sample is composed mainly by males, with similar levels of primary and professional education, similar seniority, same activity and equal contract type. However, as we found some variability in the company size variable, we have carried out a control analysis of this variable. Our results indicate that there is no significant categorical moderating effect of company size is observed, and we can conclude that it is not necessary to consider different programs to improve the general health of workers in the construction sector based on the company's size. Based on the obtained results, the conclusions and recommendations can be generalized for companies of any size.

5.1. Future line of research

The usefulness of the safety climate measurements depends on their capability to represent the reality of the companies, including as many as possible different aspects. The way to obtain the items to measure those aspects is usually dependable on the specific survey to capture workers' perceptions of safety at companies. As we have used a European-wide survey that includes all sectors and asks questions that can reflect these aspects, our structural model can be replicated in other sectors, industries, and countries in order to compare results. Differently to previous studies, we have explicitly reported all items that we have measured each factor using data from the European Working Condition Survey. We have also made recommendations for changing or adapting some questions of that survey, and we propose for future researchers to include these modified questions or to elaborate a more complete specific questionnaire. Furthermore, it will be interesting as well to test our model with larger samples in different industries and countries to be able to compare results and make targeted proposals and, finally, check whether these findings are robust and can be generalized.

6. Conclusions

Workers' mental and physical health are influenced by several factors, including, but not limited to, safety climate, work-life balance, and job rewards and compensations.

These findings have several implications for human resource management in the construction sector, especially for implementing policies and interventions aimed at positively influencing workers' mental and physical health. The relationship between work aspects related to safety climate and some aspects of job satisfaction is essential for the human resources department. These work aspects are organizational factors that can be managed and have a direct impact on workers' health. Regarding our results, we can state that organizational factors are fundamental in creating a good safety performance. Therefore, managers should focus on management commitment and safety communication. Furthermore, if these factors are combined with adequate management of work-life balance, the results in terms of workers' health will be improved.

7. Theoretical implications

- One objective is to validate the measures of workers' mental and physical health through an available questionnaire. The items that were not included in our model (because they were measured in the EWCS with inappropriate scales to be included) might be considered on another measurement scale (e.g., Likert, semantic differential, or Stapel scale), and then, validate the broader measurement model.
- A second objective is to validate a measurement model for safety climate as an unobservable second-order latent construct formed by management commitment, safety communication, employee involvement, psychological capital, risk appraisal and risk-taking, and management support. All of these factors have previously been proposed in the literature, but until now they have not been empirically analyzed as a whole with the same sample. To the best of our knowledge, this research contributes to the literature by being the first empirical research, that incorporates the psychological capital factor as an element affecting safety climate.
- We propose and validate a structural model to explain workers' mental and physical health as a function of safety climate with the mediation of some elements of job satisfaction, including working conditions, work-life balance, and job rewards and compensations.

8. Practical implications

- To establish a ranking of importance in explaining safety climate, including new factors to consider in future research. Managers can significantly improve the safety climate in their companies by being committed to their role as managers in terms of an effective work organization, trusting their employees, setting an example of integrating safety into the company, valuing workers' safe behaviors, making people work together, ensuring fluid communication among all the staff members, or positively valuing their employees' attitudes, among other actions.
- To contribute to enhancing mental health, special attention should be placed on work-life balance, safety climate, and, finally, on job rewards and compensations. We emphasize that most of these factors can be controlled and influenced by specific actions of managers in organizations.
- To study the safety climate using the EWCS, with some recommendations to include or complete some factors. This data sample is available to anyone interested and allows for comparative studies as the data are collected with a consistent and homogeneous methodology across different European countries.

As we have discussed, this study has several implications for human resource managers in the construction sector. We believe that the implications derived from our study are helpful in taking some steps to protect workers' health, which is one of the main goals of many international institutions such as the EU, the International Labor Organization, and the World Health Organization, among others. Our intention was to provide a starting point to better understand what practices can be implemented by companies to improve workers' health.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jsr.2023.10.007.

References

Ajslev, J., Dastjerdi, E. L., Dyreborg, J., Kines, P., Jeschke, K. C., Sundstrup, E., Jakobsen, M. D., Fallentin, N., & Andersen, L. L. (2017). Safety climate and accidents at work: Cross-sectional study among 15,000 workers of the general working population. *Safety Science, 91*, 320–325. https://doi.org/10.1016/j.ssci.2016.08.029

Aliabadi, M. M., Darvishi, E., Shahidi, R., Ghasemi, F., & Mahdinia, M. (2020). Explanation and prediction of accidents using the path analysis approach in industrial units: The effect of safety performance and climate. *Work, 66*(3), 617–624. https://doi.org/10.3233/WOR-203204

Andersen, L. P., Nørdam, L., Joensson, T., Kines, P., & Nielsen, K. J. (2018). Social identity, safety climate and self-reported accidents among construction workers. *Construction Management and Economics, 36*(1), 22–31. https://doi.org/10.1080/01446193.2017.1339360

Arocena, P., Núñez, I., & Villanueva, M. (2008). The impact of prevention measures and organisational factors on occupational injuries. *Safety Science, 46*(9), 1369–1384. https://doi.org/10.1016/j.ssci.2007.09.003

Bakhshi, A., Sharma, S., Kumar, K., & Sharma, A. (2008). Job satisfaction as predictor of life satisfaction: A study on lecturers in government & private colleges in Jammu. *Prachi Psycho-cultural Research Association, 24*(2), 1–6.

Balogun, A. O., Andel, S. A., & Smith, T. D. (2020). "Digging Deeper" into the Relationship Between Safety Climate and Turnover Intention Among Stone, Sand and Gravel Mine Workers: Job Satisfaction as a Mediator. International Journal of Environmental Research and Public Health, 17(6), 1925. MDPI AG. Retrieved from https://doi.org/10.3390/ijerph17061925.

Bamel, U. K., Pandey, R., & Gupta, A. (2020). Safety climate: Systematic literature network analysis of 38 years (1980-2018) of research. Accident Analysis and Prevention, 135. https://0-doi-org.llull.uib.es/10.1016/j.aap.2019.105387.

Bergheim, K., Nielsen, M. B., Mearns, K., & Eid, J. (2015). The relationship between psychological capital, job satisfaction, and safety perceptions in the maritime industry. *Safety Science, 74*, 27–36.

Borgheipour, H., Eskandari, D., Barkhordari, A., Mavaji, M., & Tehrani, G. M. (2020). Predicting the relationship between safety climate and safety performance in cement industry. *Work, 66*(1), 109–117. https://doi.org/10.3233/WOR-203155

Casey, T., Griffin, M. A., Flatau Harrison, H., & Neal, A. (2017). Safety Climate and Culture: Integrating Psychological and Systems Perspectives. *J. Occup. Health Psychol., 22*, 341–353.

Chan, A. P. C., Wong, F. K. W., Hon, C. K. H., Lyu, S., & Javed, A. A. (2017). Investigating ethnic minorities' perceptions of safety climate in the construction industry. *Journal of Safety Research, 63*, 9–19. https://doi.org/10.1016/j.jsr.2017.08.006

Chen, W. T., Merrett, H. C., Huang, Y.-H., Bria, T. A., & Lin, Y.-H. (2021). Exploring the Relationship between Safety Climate and Worker Safety Behavior on Building Construction Sites in Taiwan. *SUSTAINABILITY, 13*(6), 3326. https://doi.org/10.3390/su13063326

Chen, F. F., Sousa, K. H., & West, S. G. (2005). Testing measurement invariance of second-order factor models. *Structural Equation Modeling, 12*(3), 471–492.

Choudhry, R. M., Fang, D., & Lingard, H. (2009). Measuring safety climate of a construction company. *Journal of Construction Engineering and Management, 135*(9), 890–899. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000063

Clarke, S. (2010). An integrative model of safety climate: Linking psychological climate and work attitudes to individual safety outcomes using meta-analysis. *J. Occup. Org. Psychol., 83*(3), 553–578. https://doi.org/10.1348/096317909X452122

Cohen, J. (1988). Set correlation and contingency tables. *Applied psychological measurement, 12*(4), 425–434.

Cottini, E., & Lucifora, C. (2013). Mental Health and Working Conditions in Europe. *ILR Review, 66*(4), 958–988. https://doi.org/10.1177/001979391306600409

Del Castillo Puente, Ángel María. (2008). "Axiomas Fundamentales de la Investigación de Mercados". Netbiblo, S.L., p. 45.

Edgar, F., & Geare, A. (2005). HRM practice and employee attitudes: Different measures-different results. *Personnel Review, 34*, 534–549. https://doi.org/10.1108/00483480510612503

European Foundation for the Improvement of Living and Working Conditions (2017). European Working Conditions Survey, 2015. [data collection]. 4th Edition. UK Data Service. SN: 8098, http://doi.org/10.5255/UKDA-SN-8098-4.

Eurostat (2019a). Official EU statistics. Standardised incidence rate of fatal accidents in agriculture, industry and construction sector in UE 2019. online data code: hsw_mi01.

Eurostat (2019b). European statistics database with aggregated data for all the Members of the UE-27: HSW_OCC_INA.

Falk, R. F., & Miller, N. B. (1992). *A Primer for Soft Modeling* (1st edition). Univ of Akron Pr.

Fang, D., Chen, Y., & Wong, L. (2006). Safety climate in construction industry: A case study in Hong Kong. *J. Construct. Eng. Manage., 132*(6), 573–584.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*, 1149–1160.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50.

Forteza, F. J., Carretero-Gómez, J. M., & Sese, A. (2017). Effects of organizational complexity and resources on construction site risk. *Journal of Safety Research, 62*, 185–198.

Geisser, S. (1975). The Predictive Sample Reuse Method with Applications. *Journal of the American Statistical Association, 70*(350), 320–328. https://doi.org/10.1080/01621459.1975.10479865

Goldenhar, L. M., Williams, L. J., & Swanson, N. G. (2003). Modeling relationships between job stressors and injury and near-miss outcomes for construction labourers. *Work & Stress, 17*(3), 218–240. https://doi.org/10.1080/02678370310001616144

Gomez, B. D., & Lucia, C. A. M. (2018). A self-determination theory approach to health and well-being in the workplace: Results from the sixth European working conditions survey in Spain. *Journal of Applied Social Psychology, 48*(5), 269–283. https://doi.org/10.1111/jasp.12511

Guldenmund, F. (2000). The nature of safety culture: A review of theory and research. *Safety Science, 34*(1), 215–257. https://doi.org/10.1016/S0925-7535(00)00014-X

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis* (Vol. 6). Upper Saddle River, NJ: Pearson Prentice Hall.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. *Journal of Marketing Theory and Practice, 19*(2), 139–152. https://doi.org/10.2753/MTP1069-6679190202

Hair, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2018). *Advanced issues in partial least squares structural equation modeling*. SAGE.

Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science, 40*(3), 414–433. https://doi.org/10.1007/s11747-011-0261-6

Hair, J., Hult, G. T., Ringle, C., & Sarstedt, M. (2014). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). 2014 Faculty Bookshelf. http://digitalcommons.kennesaw.edu/facbooks2014/39.

Hair, J., Hult, G., Ringle, C., & Sarstedt, M. (2016). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). *SAGE*. Publications.

Han, B., Son, S., & Kim, S. (2021). Measuring Safety Climate in the Construction Industry: A Systematic Literature Review. *SUSTAINABILITY, 13*(19), 10603. https://doi.org/10.3390/su131910603

Huang, Y.-H., Lee, J., McFadden, A. C., Murphy, L. A., Robertson, M. M., Cheung, J. H., & Zohar, D. (2016). Beyond safety outcomes: An investigation of the impact of safety climate on job satisfaction, employee engagement and turnover using social exchange theory as the theoretical framework. *Appl. Ergon., 2016*(55), 248–257.

Hünefeld, L., Gerstenberg, S., & Hüffmeier, J. (2020). Job satisfaction and mental health of temporary agency workers in Europe: A systematic review and research agenda. *Work & Stress, 34*(1), 82–110. https://doi.org/10.1080/02678373.2019.1567619

INE (2015). Encuesta de Población Activa (EPA) Cuarto trimestre de 2015. Statistics National Institute from Ministry of Labor, Migrations and Social Security. Spanish government. https://www.ine.es/daco/daco42/daco4211/epa0415.pdf.

INE (2019) Estructura y dinamismo del tejido empresarial en España Directorio Central de Empresas (DIRCE) a 1 de enero de 2019. Statistics National Institute from Ministry of Labor, Migrations and Social Security. Spanish Government. https://www.ine.es/prensa/dirce_2019.pdf.

Jeschke, K. C., Kines, P., Rasmussen, L., Andersen, L. P. S., Dyreborg, J., Ajslev, J., … Andersen, L. L. (2017). Process evaluation of a Toolbox-training program for construction foremen in Denmark. *Safety Science, 94*, 152–160. https://doi.org/10.1016/j.ssci.2017.01.010

Karasek, R., & Theorell, T. (1990). *Healthy Work: Stress, Productivity, and the Reconstruction of Working Life* (p. 19). New York, USA: Basis Books.

Karimpour, S., Jahani, F., & Shirali, G. A. (2021). The relationship between safety attitude and safety performance in the petrochemical industry: The mediating role of safety climate. *Work, 68*(2), 507–517. https://doi.org/10.3233/WOR-203353

Katz, A. S., Pronk, N. P., McLellan, D., Dennerlein, J., & Katz, J. N. (2019). Perceived Workplace Health and Safety Climates: Associations With Worker Outcomes and Productivity. *American Journal of Preventive Medicine, 57*(4), 487–494. https://doi.org/10.1016/j.amepre.2019.05.013

Kim, S., Song, S., Lee, D., Kim, D., Lee, S., & Irizarry, J. (2021). A Conceptual Model of Multi-Spectra Perceptions for Enhancing the Safety Climate in Construction Workplaces. *BUILDINGS, 11*(8), 347. https://doi.org/10.3390/buildings11080347

Koufteros, X., Babbar, S., & Kaighobadi, M. (2009). A paradigm for examining second order factor models employing structural equation modeling. *International Journal of Production Economics, 120*(2), 633–652.

Kramer, D. M., Bigelow, P. L., Carlan, N., Wells, R. P., Garritano, E., Vi, P., & Plawinski, M. (2010). Searching for needles in a haystack: Identifying innovations to prevent MSDs in the construction sector. *Applied Ergonomics, 41*(4), 577–584. https://doi.org/10.1016/j.apergo.2009.12.003

de Lima Silva Nunes, R., de Camargo Silva, A. E. B., de Lima, J. C., Carvalho, D. E., Bernardes, C. A., Sousa, T. P., Gimenes, F. R. E., & Pires, A. C. A. C. (2021). Factors influencing the patient safety climate in intensive care units: cross-sectional study. BMC Nursing, 20(1), 1–8. https://0-doi-org.llull.uib.es/10.1186/s12912-021-00643-x.

Lingard, H., Cooke, T., & Blismas, N. (2012). Do Perceptions of Supervisors' Safety Responses Mediate the Relationship between Perceptions of the Organizational Safety Climate and Incident Rates in the Construction Supply Chain? *Journal of Construction Engineering & Management, 138*(2), 234–241. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000372

Locke, E. A. (1976). The nature and causes of job satisfaction. In M. D. Dunnette (Ed.), *Handbook of industrial and organizational psychology* (pp. 1297–1349). Chicago, IL: Rand McNally.

Locke & Latham. (1990) Work Motivation and Satisfaction: Light at the End of the Tunnel.

Luo, T. (2020). Safety climate: Current status of the research and future prospects. *Journal of Safety Science and Resilience, 1*(2), 106–119. https://doi.org/10.1016/j.jnlssr.2020.09.001

Luthans, F. (2002). The need for and meaning of positive organizational behavior. *Journal of Organizational Behavior., 23*, 695–706.

Markel, K. S., & Frone, M. R. (1998). Job characteristics, work–school conflict, and school outcomes among adolescents: Testing a structural model. *Journal of Applied Psychology, 83*(2), 277–287. https://doi.org/10.1037/0021-9010.83.2.277

Molinillo, S., Aguilar-Illescas, R., Anaya-Sánchez, R., & Liébana-Cabanillas, F. (2021). Social commerce website design, perceived value and loyalty behavior intentions: The moderating roles of gender, age and frequency of use. Journal of Retailing and Consumer Services, 63. Scopus. https://doi.org/10.1016/j.jretconser.2020.102404.

Mosly, I. (2019). Factors influencing safety climate in the construction industry: A review. *Int. J. Constr. Eng. Manag., 8*, 105–109.

Nappo, N. (2019). Is there an association between working conditions and health? An analysis of the Sixth European Working Conditions Survey data. *PLoS ONE, 14*(2), 1–15. https://doi.org/10.1371/journal.pone.0211294

Nielsen, K., Nielsen, M. B., Ogbonnaya, C., Känsälä, M., Saari, E., & Isaksson, K. (2017). Workplace resources to improve both employee well-being and performance: A systematic review and meta-analysis. *Work and Stress: An International Journal of Work, Health, & Organization, 31*, 101–120. https://doi.org/10.1080/02678373.2017.1304463

Niu, M., Leicht, R. M., & Rowlinson, S. (2016). Overview and Analysis of Safety Climate Studies in the Construction Industry. *Construction Research Congress 2016: Old and New Construction Technologies Converge in Historic San Juan - Proceedings of the 2016 Construction Research Congress*.

Nunkoo, R., Teeroovengadum, V., Thomas, P., & Leonard, L. (2017). Integrating service quality as a second-order factor in a customer satisfaction and loyalty model. *International Journal of Contemporary Hospitality Management, 29*(12), 2978–3005. https://doi.org/10.1108/IJCHM-11-2016-0610

Nunnally, J. C. (1978). *Psychometric*. McGraw-Hill.

Phipps, D. L., Malley, C., & Ashcroft, D. M. (2012). Job characteristics and safety climate: The role of effort-reward and demand-control-support models. *Journal of Occupational Health Psychology, 17*(3), 279–289. https://doi.org/10.1037/a0028675

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *The Journal of Applied Psychology, 88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

Punzo, G., Castellano, R., & Buonocore, M. (2018). Job Satisfaction in the "Big Four" of Europe: Reasoning Between Feeling and Uncertainty Through CUB Models. *Soc Indic Res, 139*, 205–236. https://doi.org/10.1007/s11205-017-1715-0

Rindskopf, D., & Rose, T. (1988). Some theory and applications of confirmatory secondorder factor analysis. *Multivariate Behavioral Research, 23*(1), 51–67.

Ringle, C. M., Wende, S., & Becker, J.-M. (2015). SmartPLS 3.0 [computer software]. Retrieved from *GmbH: Boenningstedt*. http://www.smartpls.com.

Roelen, C. A. M., Koopmans, P. C., & Groothoff, J. W. (2008). Which work factors determine job satisfaction? *Work, 30*(4), 433–439.

Romero, Á., González, M. N., Villena, B. M., Segarra, M., & Rodríguez, Á. (2019). Mind the Gap: Professionalization is the Key to Strengthening Safety and Leadership in the Construction Sector. *International Journal of Environmental Research and Public Health, 16*(11). https://doi.org/10.3390/ijerph16112045

Schwatka, N. V., Hecker, S., & Goldenhar, L. M. (2016). Defining and Measuring Safety Climate: A Review of the Construction Industry Literature. *Annals of Occupational Hygiene, 60*(5), 537–550. https://doi.org/10.1093/annhyg/mew020

Siegrist, J. (1996). Adverse health effects of high-effort/low-reward conditions. *Journal of Occupational Health Psychology, 1*(1), 27–41. https://doi.org/10.1037/1076-8998.1.1.27

Smith, T. D. (2018). An assessment of safety climate, job satisfaction and turnover intention relationships using a national sample of workers from the USA. *International Journal of Occupational Safety and Ergonomics, 24*(1), 27–34. https://doi.org/10.1080/10803548.2016.1268446

Stratman, J. L., & Youssef-Morgan, C. M. (2019). Can positivity promote safety? Psychological capital development combats cynicism and unsafe behavior. *Safety Science, 116*, 13–25. https://doi.org/10.1016/j.ssci.2019.02.031

Wang, D., Wang, X., & Xia, N. (2018). How safety-related stress affects workers' safety behavior: The moderating role of psychological capital. *Safety Science, 103*, 247–259. https://doi.org/10.1016/j.ssci.2017.11.020

Zhou, Z., Goh, Y. M., & Li, Q. (2015). Overview and analysis of safety management studies in the construction industry. *Saf. Sci., 72*, 337–350.

Zohar, D. (1980). Safety climate in industrial organizations: Theoretical and applied implications. *Journal of Applied Psychology, 65*(1), 96–102. https://doi.org/10.1037/0021-9010.65.1.96

Zohar, D. (2000). A group-level model of safety climate: Testing the effect of group climate on micro-accidents in manufacturing jobs. *Journal of Applied Psychology, 85*, 587–596.

Zohar, D. (2014). Safety climate: Conceptualization, measurement, and improvement. In B. Schneider, & K. M. Barbera (Eds.), *The Oxford handbook of organizational climate and culture* (pp. 317–334). Oxford University Press.

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