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Occupational Safety from an Individual Perspective: The Influence of Extraversion on Compliance with Safety Standards for Emergency Employees and Nurses

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Abstract: When analyzing occupational safety factors, a human factor is associated with 80–90% of incidents and accidents that occur. Controlling this factor is essential when it comes to creating healthy and safe organizations. Personality traits have shown great relevance when understanding the behavior of safety or self-protection in the workplace, affecting the motivation of subjects and, therefore, their behavior. The objective of this study is to analyze the influence of the extraversion trait on compliance with safety rules and behaviors, while evaluating the mediating effect of motivation for safety in health professionals. The sample is composed of 183 nurses and wardens of a hospital in Spain. The obtained results confirm the hypotheses raised, validating the negative influences of extraversion on motivation for security and compliance with norms, behaviors, and security, while verifying the effect of the total mediation of motivation for security in the influence of extraversion on security compliance. This confirms the effect of this personality trait on employees' safety behaviors, and the possibility of reducing this influence by controlling personal motivations with interventions from the organization.

Keywords: occupational safety; extraversion; security motivation; security compliance; health professionals

Citation: Albalá-Genol, J.; Díaz-Fúnez, P.A.; Martín-Martín, F.G.; Mañas-Rodríguez, M.A. Occupational Safety from an Individual Perspective: The Influence of Extraversion on Compliance with Safety Standards for Emergency Employees and Nurses. *Merits* **2024**, *4*, 251–262. https://doi.org/10.3390/merits4030018

Academic Editors: Joseph A. Allen and Matthew S. Thiese

Received: 22 May 2024
Revised: 11 July 2024
Accepted: 22 July 2024
Published: 1 August 2024

1. Introduction

When studying safety in the workplace, the concept of "safety culture" is decisive. This variable has shown relevance not only in the study of workplace safety behavior [1] but also in other areas related to this area, such as the risk of engaging in sexual relations [2] or being involved in traffic accidents [3].

The evolution of the study of the relationship between personality and safety at work has focused on three issues: studies on the characteristics of employees and their influence on the adoption of safety behaviors [4]; analysis of the dimensions of personality and its relationship with exposure to risky behaviors [5]; and the investigation of subjective risk assessments [6]. Most of these studies have been characterized by a low theoretical base [7], with one of their challenges being to find reliable and non-contradictory results in the same single direction [8,9]. For this, the main obstacle has been the use of personality measurements from different taxonomies and theories [10]. One model that is emerging strongly in personality research is the so-called "Big Five Model" [11]. This has been shown to be a valid taxonomy for measuring personality [12,13] and has been used successfully in many studies related to organizational context [14,15].

As a collective, health workers (health and welfare professionals) are among those with the highest rates of workplace risk and injury [16]. The study of workplace accidents among healthcare workers is crucial due to their high exposure to biological, chemical, and physical risks, impacting their well-being and the quality of healthcare services. According to Lamba and Saha [17], the prevention and proper management of these accidents

not only protect professionals but also improve the efficiency and safety of the hospital environment. Additionally, García and Pérez [18] emphasize that the implementation of updated safety protocols is essential to reduce the incidence of these accidents and ensure a safe working environment.

Many investigations have described the occupational hazards associated with the job that affect these professionals [19,20]. In order to reduce risk levels in these groups, study of the cognitive, perceptual, and physical limitations of workers in the design of occupational environments is becoming increasingly important [21], adding aspects such as the characteristics of workers [22].

The objective of this paper is to provide evidence about the influence of personality on safety behaviors in a group as sensitive to risk as health professionals. In order to do this, we will analyze the influence of the personality trait of extraversion from the Big Five theory [11] on the fulfillment of safety and self-protection behaviors in emergency health professionals of a hospital, evaluating the mediating effect of motivation for safety.

Health workers perform their activities in an environment with high exposure to multiple occupational hazards [23]. Among all possible conditions, several research articles highlight two as the most important in this group [24]. On the one hand, musculoskeletal problems and, on the other hand, transmission of contagion, which is known as biological risk.

The idea that specific situational demands and labor characteristics interact with personal peculiarities to influence organizational behaviors is not new [25]. In a health context, professionals face situations where they must make decisions and assume behaviors in constant states of tension [26]. This state of tension when associated with decision-making contrary to one's beliefs results in what has been termed "cognitive dissonance" [27]. Understanding how personality traits and situations interact in a practitioner's sanitation can be very useful in creating better risk management programs [28].

Several studies have shown how in a large number of accidents, a human factor is present as a key element [29]. Studies such as that developed by Hale and Glendon [30] deepened the study of these factors, showing that it is associated with 80–90% of incidents. In recent years, studies on this area have focused more on organizational and environmental factors, such as the security climate or the influence of training in the fight against accidents at work, leaving aside the studies of [10,31].

Among the elements that provide variability to people and can affect labor casualty, we find a multitude of elements, such as age, culture, educational level, sex, etc., [9]. One of the most relevant ones is personality traits ([31,32]. Recent meta-analyses have addressed the relationship between these and safety behaviors in the workplace [33,34]. Despite a significant increase in the number of studies on this subject, according to these meta-analyses, there are still three issues that have not been addressed [32].

There are several studies that have found significant associations between various aspects of personality and the assumption of safety-related behaviors, such as the classic work by Pestonjee and Singh [35] that studied the correlates of neuroticism and extraversion over accidents [36]. However, there is still not a great deal of knowledge about the relationship between these traits and safe or unsafe behaviors.

A second issue is to deepen the analysis of the general process by which personality traits influence the occurrence of an accident [31]. As a psychological construct, it is more likely that personality does not directly affect the number of accidents but that the influence is realized through the attitudes and behavior of a subject, and this is what increases the probability of the occurrence of accidents [33,34]. These mediation relationships have not been contemplated until now [32].

Finally, another question refers to the influence that a work context can have on this relationship [37]. Different studies and theories have found results in favor of the hypothesis that an individual's social and work context (leaders, peers, and job characteristics) affects their behavior ([38,39] However, there are very few studies that have personality factors added to these situational factors in predicting the safe behavior of employees [32].

First, this paper aims to clarify the magnitude and meaning of the relationships between the personality trait analyzed and safety behaviors. Second, this paper aims to show how the safety behavior of each employee is a mediating element between this personality trait and work accidents. Finally, we examine the relationship between personality traits and the socio-labor context in the prediction of employee behavior.

1.1. Predictive Model of Safety Behaviors

Developing a comprehensive model on how organizational situations and personality traits of an individual can affect job security through their behavior is not straightforward. This is based on the safety model developed by Christian et al. [33], which is based on the Neal and Griffin [34] model on safety in the workplace. This model differentiates between the distal and proximal antecedents of safety results (accidents and incidents) in the workplace, postulating that differences in the context of an individual will have effects on the individual's motivation about safety and their knowledge of the same theme. These, in turn, directly influence safety behaviors, which are subsequently related to the occurrence of safety results, such as accidents and injuries (see Figure 1).

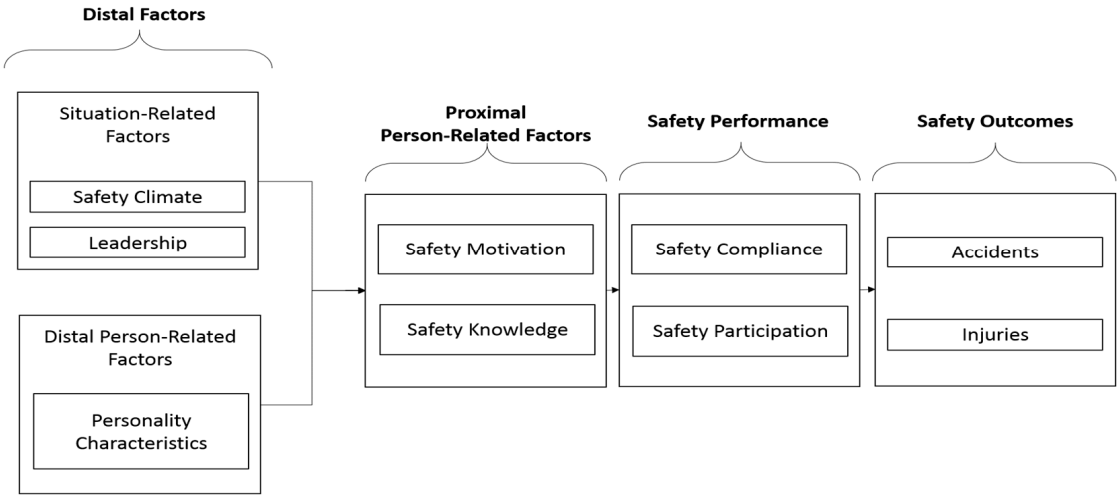

Figure 1. Comprehensive safety model at work. Adapted from Christian et al. [33].

We propose that situational factors and individual differences are distal elements. The attitudes that both aspects generate in an individual, such as motivation for safety with proximal antecedents, and safety behaviors are the only ones directly related to safety results (occurrence of the accident or incident). The existence of a theoretical framework is not only important in establishing a literature review but also in trying to understand the processes through which accidents and injuries occur in the workplace. This will allow us to propose different security criteria.

We observe distal antecedents of the occurrence of accidents and incidents in the workplace. According to Christian et al. [33], these can be differentiated into an individual's own or situation-related antecedents. Within the former are different aspects of each employee, such as personality traits and cognitive differences. These elements make the reality of the work environment perceived unique to each one of the members of the organization.

As a rule, proximal factors are expected to produce stronger relationships than distal factors on the behavior of an individual and, therefore, the occurrence of accidents and incidents. In addition, when it is theoretically relevant, the model distinguishes between safety compliance and participation in safety [34]. These authors found that security motivation was more strongly related to participation in security, while security awareness was about enforcing security.

1.2. Personality and Safety Behavior

The Barrick, Mount, and Li [40] theory can be used to address the influence of personality on safety behavior. This theory states that behavior at work is driven by the motivation of individuals to achieve implicit objectives of a higher order according to personality traits.

According to the theory of human behavior at work, the five personality traits described above predispose individuals to different degrees to strive to achieve socialization, status, autonomy, and achievement goals [40]. These objectives have been supported by different theories of motivation [41–43].

Personality traits are fundamental in the study of workplace safety, as they influence how employees perceive and manage risky situations. A recent study by Smith and Johnson [44] suggests that personality traits and cognitive differences also play a significant role in susceptibility to accidents, indicating that personalized interventions may be more effective.

According to Martínez and López [45], individuals with high conscientiousness and emotional stability tend to make fewer mistakes and have fewer accidents. Additionally, a study by Brown and Taylor [46] highlights that customizing safety interventions based on these traits can significantly improve outcomes in accident prevention at work.

1.2.1. Extraversion and Security Behavior

This work will focus on the extraversion trait as one of the most used in the study of the assumption of risky behaviors. Studying the personality trait of extraversion is essential due to its profound impact on multiple aspects of life. According to recent research, extraversion is positively associated with emotional and social well-being, facilitating significant interpersonal connections and effective adaptation in dynamic environments [47]. Additionally, extraversion has been found to be related to higher performance in roles requiring leadership and frequent interpersonal communication [48]. These studies emphasize the importance of distinguishing extraversion from other Big Five traits and how it uniquely influences the personal and professional development of individuals today. According to a recent study by Santos and Pérez [49], extraversion not only predicts social adaptation but is also positively associated with achieving long-term professional goals. Individuals with a high level of extraversion are described as affectionate, spontaneous, audacious, and fun-loving [11]. According to Barrick et al. [40], extroverts give importance to the goals of achieving certain status, and gaining power and social prestige. As a result, highly extroverted people are prone to guiding their safety-related behaviors based on how useful they are in reaching these goals. Adopting unsafe behaviors can be beneficial and rewarded initially in many contexts because of the natural balance between security and productivity [50]. In line with this approach, research has revealed positive correlations between extraversion and the adoption of unsafe behaviors [36,51], suggesting that individuals with high levels of extraversion are more likely to engage in such behaviors than those with low extraversion [8,52–54]. Consequently, the following hypothesis is proposed:

Hypothesis 1. *Extraversion negatively and significantly influences security compliance.*

1.2.2. Extraversion and Motivation for Security

A common assumption in the study of human behavior is the way subjects are motivated [55]. For this author, personality traits are combined with situational elements to produce motivational states by controlling information processing paths [56]. This model of influence of extraversion on motivation is so-called filtering of information, which was developed by Broadbent [57]. According to this, first people detect stimuli; then the information is processed and encoded; and finally, the information is stored in memory. Motivation affects each of these phases, especially the process of information coding, and from the Eysenck model, it is proposed that extraversion facilitates the processing of positive information [58].

Furthering the relationship between extraversion and motivation for safety, studies such as the one developed by Neal and Griffin [34] have found an increase in risky behaviors in individuals with high levels of extraversion, especially due to their high perception of urgency in tasks. This makes their motivation for safety diminish in favor of execution. Consequently, the following hypothesis is proposed:

Hypothesis 2. *Extraversion has a significant and negative influence on motivation for safety.*

1.2.3. Mediator Effect

Although revised meta-analyses have shown significant relationships between personality traits (extraversion) and employee safety performance [34], from the proposed work model [33]), it is hypothesized that these relationships are mediated by proximal antecedents of a cognitive type, as is the case of motivation for security. In many cases, accidents are caused by factors that we can control with the prevention policies of an organization (e.g., the effects of leadership and climatic conditions of an organization [59]); however, even in these situations the human factor plays a determining role because of its influence on the adoption of safety-related behaviors [38].

Hypothesis 3. *The motivation for security will show a mediating effect between the personality trait of extraversion and the compliance of individuals with security.*

As a summary, below we present the comprehensive scheme of work proposed in this study based on the hypotheses raised and a theoretical base model of the same (see Figure 2).

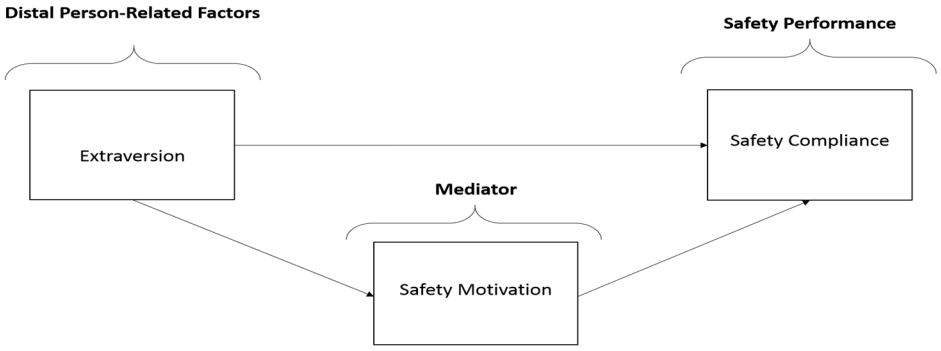

Figure 2. Comprehensive diagram of this study with our own elaboration.

2. Method

2.1. Sample

The sample of this study belongs to a pilot research study. It is composed of 183 nurses and wardens of the emergency department of a hospital. The age is distributed in four intervals (up to 30 years = 22.6%, 31–40 years = 31.2%, between 41 and 50 years = 29.8%, over 50 years = 16.4%). As for sex, 22.2% are men and 77.8% are women.

The Ethical Committee of the University of the corresponding author approved the study. The procedure for collecting information began with several meetings with the nursing department and the head of the hospital's emergency department. With them, a work plan was designed to analyze the situation of emergency nurses. In this way, questionnaires were used. The completion of these questionnaires was performed in the work center, and there was always a member of the research group present to resolve any doubts.

2.2. Instruments

Extraversion: This variable has been measured using the Eysenck Personality Questionnaire Revised-Abbreviated Questionnaire [60]. The Spanish version of the questionnaire

was used [61], which, like the original version, consists of 24 items and four subscales. The response format is Yes (1) vs. No (0), although later on, in the analysis, typified scores were used that were presented on a decimal scale from 0 to 10. The Alpha Cromback for this scale is 0.88.

Motivation for security: Individual safety motivation ratings were evaluated with adaptation, for this work, of the questionnaire developed by Neal and Griffin [62]. Safety motivation was assessed through three items that measured the extent to which individuals considered safety to be an important part of their working life. All items were measured on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The Alpha Cromback for this scale is 0.92.

Security compliance: Safety compliance was evaluated as a component of safety behavior. For this purpose, the adaptation of the questionnaire developed by Neal and Griffin [62] was used again. This variable was measured with three items. All items were measured on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The Alpha Cromback for this scale is 0.89.

Control variables: because age can influence employee behavior in the workplace [9,63], this variable was measured and controlled in the analysis performed.

2.3. Analysis

Due to an increase in the number of criticisms of the procedure to test the mediation effects developed by Baron and Kenny [64–66], in this work, the coefficient product method ($P = z\alpha \times z\beta$) proposed by McKinnon et al. [67] and some other authors [65,66] was used and shows a greater predictive power than the Baron and Kenny model [64]. In this sense, as González-Romá and Gamero [68] specify, this method provides adequate statistical power and correct indexes of type I errors. We can identify mediation as the causal relationship through which an independent variable (X) influences a mediator (M), which in turn influences a dependent variable (Y) [69]. When estimating this approach, it is necessary to check two regression models. In the first one, we consider the influence of the independent variable (X) on the mediator (M): $M = \beta o\ (1) + \alpha X + \varepsilon 1$ (where $\beta o\ (1)$ and $\varepsilon 1$ are the intercept and the error term, respectively). In the second, we analyze the influence of the mediator (M) on the dependent variable (Y) controlling the independent variable (X): $Y = \beta o\ (2) + \tau X + \beta M + \varepsilon 2$. The product $\alpha\beta$ represents the estimation of the mediated or indirect effect, while (τ) is the unmediated or direct effect. It is accepted that a relationship is mediated if (1) X is significantly related to M, (2) M is significantly related to Y after controlling X, and (3) the mediated or indirect effect is statistically significant [68,70]. The regression models were estimated with SPSS 24.

3. Results

3.1. Descriptive Statistics

Table 1 shows the means, standard deviations, and correlation analysis of all study variables. As can be seen, data on safety motivation (mean of 4.35, standard deviation of 0.67) and safety compliance (mean of 4.69, standard deviation of 0.22) have fairly high average scores. The extraversion variable shows intermediate values (mean of 5.79, standard deviation of 2.62).

Table 1. Mean, standard deviation, internal consistency, and correlations between study variables.

Variables	M	SD	1	2	3	4
1. Extraversion	5.79	2.62	(0.88)			
2. Safety motivation	4.35	0.67	−0.22 *	(0.92)		
3. Safety compliance	4.69	0.22	−0.19 *	0.59 ***	(0.88)	
4. Age	2.43	0.65	-	-	-	-

Note. Internal consistency data on the diagonal. * $p < 0.05$; *** $p < 0.001$.

Regarding correlation data, there is a statistically significant positive relationship between safety motivation and safety compliance (r = 0.59, sig = 0.001). On the other hand, there are statistically significant and negative relationships between extraversion and motivation for safety (r = 0.22, sig = 0.05); and extraversion and safety compliance (r = −0.19, sig = 0.05), although in these cases, the significance is lower.

3.2. Results of Hierarchical Regression Analysis

The results of the mediation analysis are shown in Table 2. Age did not present a statistically significant influence on results in the model presented. The personality trait of extraversion presented a significant and negative influence on security motivation ($\alpha = -0.24$, error type = 0.13, $p > 0.05$), and security motivation presented a significant and positive influence on compliance of security ($\beta = 0.46$, typical error = 0.05, $p > 0.001$). The estimated indirect effect ($\alpha\beta = 0.20$) was statistically significant ($P = z\alpha \times z\beta = 12.5$, $p > 05$). The direct effect of the extraversion trait was no longer significant in its influence on safety compliance ($\tau = -0.02$, error type = 0.15, p = n.s). Therefore, the influence between the extraversion trait and safety compliance was totally mediated by the worker's safety motivation.

Table 2. Results of the hierarchical regression model.

	Mediator			**Safety Compliance**		
	β	**SE**	**R^2**	**B**	**SE**	**R^2**
1. Age	0.03	0.05	-	0.01	0.03	-
Extraversion	−0.24 *	0.13	0.20	−0.13 *	0.04	0.09
2. Age				0.00	0.03	-
Extraversion				−0.02	0.15	0.17
Safety motivation (M)				−46 ***	0.05	0.17

Note. M = Mediator. * $p < 0.05$; *** $p < 0.001$.

4. Discussion

The objective of this work is to provide evidence about the influence of personality on safety behaviors and self-protection in the workplace, taking as a study population a group of health professionals in the emergency area of a hospital in Spain.

The first hypothesis states that the personality trait of extraversion negatively and significantly influences the safety compliance of study subjects. The results confirm this association ($\beta = -0.13$, $p < 0.05$), suggesting that the existence of high extraversion levels in health professionals will reduce compliance with safety rules and procedures.

The second hypothesis proposes the significant and negative influence of the personality trait of extraversion on motivation for safety. Considering the results ($\beta = -0.24$, $p < 0.05$), this hypothesis is confirmed. The existence of a high value in the personality trait of extraversion will reduce motivation towards safety in the emergency employees that compose the sample.

The third hypothesis raises the effect of mediating the motivation for security on the relationship between the personality trait of extraversion and security compliance. Thus, when safety motivation is included in the regression equation, the influence of extraversion on safety compliance is no longer significant ($\beta = -0.02$, p: n.s.). This suggests that the existence of a highly extraverted personality trait in individuals influences compliance with safety behaviors and norms at work, but this influence is given in its entirety through extraversion in the motivation for safety of employees.

The results obtained have confirmed the hypotheses, validating the interactions between the personality trait of extraversion, motivation for employee safety, and behavior of the individual through compliance with safety and self-protection rules and activities.

4.1. Theoretical Implications

This study makes an innovative contribution by developing a complex study model of the influence of a personality trait differentiated in each individual (extraversion) on the individual's behavior in tasks of safety and self-protection through the safety compliance and motivation of people for safety. For this reason, we can speak mainly of three theoretical implications.

The first theoretical implication is related to the inclusion of a new variable in the study of worker occupational safety. The personality variable belongs to the personal field of workers, and there is little research that has considered this variable to understand the safety performance of employees in an organization, and the results of the few existing studies are contradictory due to the lack of homogeneity when addressing the variable of personality [10]. The present work deepens knowledge about this variable, approaching it from the "Big Five" model [71], which is of great relevance in the recent study of personality.

The second theoretical contribution of this work is the inclusion of an integral safety model [33] as a complete explanatory model to understand how personality influences the occurrence of accidents in the workplace. The present study proposes this integral safety model as a starting point for the study of both organizational and individual influence in the occurrence of accidents and incidents in the workplace.

The third theoretical implication is the confirmation that the effects of individual personality traits do not directly influence the behavior of an individual, but their influence is given through motivational factors. These results are in line with the previous proposals of Christian et al. [33] and Neal and Griffin [34]. These studies showed how the influence of personality on behavior is not direct but is given through its influence on the cognitive aspects of an individual.

4.2. Practical Implications

Firstly, there is a need to know and consider the personal differences of each employee in the management of aspects such as job security. This element is a determinant in the knowledge of the behavior trends of people, regarding the security behaviors and self-protection of individuals. Being able to determine these differences will allow organizations to establish more effective prevention programs to reduce noncompliance with safety standards, as well as perform unsecured behaviors, which are present in about 90% of incidents or accidents at work, according to Hale and Glendon [30]

The second practical implication of this work is that the results show how motivation is a key element in determining the influence of personality on the behavior of an individual, as indicated by the theory of motivation [41–43]. This is of great relevance since it will allow organizations to work on interventions that directly affect motivation for employee's safety. This will reduce the incidence of personality traits in behavior, without having to intervene directly on them.

The third practical implication has to do with an organization in general. Implementing improvements in the fulfillment of work safety in organizations will enable organizations to turn into healthier places that will affect other aspects of employee well-being [72].

4.3. Limitations

First, the results were obtained from self-reports and could be affected by variance of the common method.

Secondly, the sample is very specific and small, as it is a pilot study and limited to the collective of personnel of a regional hospital in Spain. Therefore, the results have to be generalized with great caution for other types of organizations. However, these results are interesting for practical reasons in order to obtain input for interventions and to improve the performance of safety behaviors and develop healthier organizations.

Third, the design of the study has a transverse nature, which prevents us from drawing conclusions about the temporal order of effects and causal relationships. However, the

longitudinal effects of the test were not the main objective of this study; what was being tested was a model of mediation for motivation, while trying to test a model.

4.4. Upcoming Research Proposals

Following the above limitations, we can suggest some guidelines to be addressed for future research. First, use other forms for data collection. In addition to self-report tools, it is recommended to use records by direct observation or critical incident evaluation interviews. This would provide complementary measures that will corroborate the goodness of the data used.

Second, it is desirable to increase the sample spectrum of the study. Analyzing the study model proposed in samples different from the one used in this study will allow comparison of the results in other work contexts. Of particular relevance in future works will be the comparison of samples of public and private administration, which is a dichotomous source of interest in multiple variables.

Third, it is necessary to carry out longitudinal studies that allow us to analyze the evolution of influence and causal influences in improving the perception of justice about well-being, group performance, and work–family balance.

It would also be advisable to go deeper into the study of other elements in order to be able to compare the integral security model [33] in its entirety. In order to do this, it is possible to propose analysis that includes elements of the organizational context, such as the implementation of an adequate preventive culture or comparing public and private company results. These parameters can affect motivation for the safety of employees, affect key aspects such as safety knowledge, or differentiate working conditions resulting from an accident or work incident.

5. Conclusions

The current research study contributes to the literature by examining the role of personality traits in an integral safety model [33] as a complete explanatory model to understand how personality influences the occurrence of accidents in the workplace. The effects of individual personality traits do not directly influence the behavior of an individual but their influence is given through motivational factors. Thus, we identified a relevant effect of an individual characteristic on the safety behaviors of healthcare professionals.

Author Contributions: Conceptualization, J.A.-G., P.A.D.-F. and M.A.M.-R.; methodology, J.A.-G., M.A.M.-R. and F.G.M.-M.; validation, P.A.D.-F. and M.A.M.-R.; formal analysis, J.A.-G. and P.A.D.-F.; investigation J.A.-G., P.A.D.-F., F.G.M.-M. and M.A.M.-R.; resources, J.A.-G. and M.A.M.-R.; data curation, J.A.-G. and P.A.D.-F.; writing—original draft preparation, J.A.-G.; writing—review and editing, J.A.-G., P.A.D.-F., F.G.M.-M. and M.A.M.-R.; visualization, P.A.D.-F.; supervision, M.A.M.-R.; All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of University of Almería (protocol code UALBIO2018/027).

Informed Consent Statement: To take part in the study, participants gave online informed consent.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors on request.

Conflicts of Interest: The authors declare no conflicts of interest.

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