

# Can Perceived Quality of Protective Equipment Increase Safety Motivation?

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Safety motivation is, nowadays, acknowledged as a key determinant of safety performance. The relationship between motivation, work injuries and accidents has been confirmed by numerous studies that found that safety behavior is associated with fewer injuries and accidents and that some safety behavior, voluntary safety behavior (such as safety participation), is largely induced by motivation to work safely. Safety motivation can be considered as a multi-dimensional construct, in which it is possible to distinguish between controlled safety motivation and autonomous safety motivation on the basis of the degree of internalization of safety motivation at the individual level. The aim of this study was to shed some light on the antecedents of safety motivation and, in particular, on the role of safety values (i.e. individual perception of the priority given to safety at work) as a mediator between perceived quality of Personal protective equipment (PPE) and both dimensions of safety motivation: autonomous and controlled. The sample consisted of 426 employees who worked in three process industries. The data was collected by an anonymous questionnaire with validated measures. A statistical mediation model was adopted to analyze the data. The results show that general safety motivation is affected by perceived equipment quality directly and indirectly (via company safety value). Controlled safety motivation is not affected by perceived equipment quality (directly or indirectly). On the contrary, autonomous safety motivation is affected by perceived equipment quality directly and indirectly (via company safety value). The results are essential to define how PPE should be introduced not only to protect the workers but to increase their safety motivation too.

## 1. Introduction

Safety is a major concern for organization nowadays. Recent evidence highlighted that there were over 3.3 million non-fatal accidents (with at least 4 days work loss) in Europe in workplace contexts in 2017. Furthermore, while the number of fatal accidents remained stable from 2016 (more or less one every 942 non-fatal), an increase of the overall non-fatal accidents was recorded in 2017 (Eurostat, 2019). Among European countries, Italy stands above average, indicating the presence of poor working conditions in terms of workplace safety. Due to the extreme health and economic costs of workplace accidents and injuries, organizations are nowadays focused on raising safety performance of workers as a means of improving overall levels of organizational safety. With this regard, a vast amount of scientific evidence underlines that safety motivation of workers plays a crucial role in determining the adoption of safe behaviors (Hedlund et al. 2016; Jiang & Tetrick, 2016). Despite the acknowledgement of the vital role of safety motivation for safety performance, a clear and accurate description of its psychosocial antecedents is still missing. Accordingly, the main goal of this study is to shed some light on safety motivation antecedents, in particular, by analyzing the influence of organizational safety values and workers' perceptions of personal protective equipment (PPE) on safety motivation. Concerning the latter, PPE perceived quality can be considered by workers as an index of the attention that organizations pay to safety. In these terms, it is assumed that workers' perception concerning the quality of PPE may directly influence their perceptions of organizational safety values, which, in turn, affect safety motivation. Specifically, the Self-determination Theory (Deci & Ryan, 2000) will serve as a theoretical framework to explain the multidimensionality of the construct, while Neal and Griffin's model (2006), verified in Italian context too (Toderi et al., 2015) will be used to explain the dynamics between the

psychosocial factors influencing safety motivation. To date, few studies have analyzed the impact of the workers' perception of PPE and their influence on motivation. This research lies within the field of occupational safety, since its focus is on workers' perceptions of safety-related themes. To be specific, the reasons for this are that, while the concern of process safety is related to the prevention of major accidents through the management of hazards associated with industrial processes, occupational safety is concerned with the safety, health, and welfare of people at work (Hofmann, Burke, & Zohar, 2017). Through this research, many implications for following studies and practitioners are found and discussed.

## 2. The central role of safety motivation

According to Neal and Griffin (2006), safety motivation can be defined as a workers willingness to spend time and energies to enact safety behaviors and the valence associated with them (Neal & Griffin, 2006). The provided definition highlights by its self that motivation is directly connected with behaviors: in other words, in accordance with scientific evidence, the more workers are motivated to act safely, the more they will be engaged in performing safely (Chen et al., 2019). According to the Self-Determination Theory (Deci & Ryan, 2000), motivation is a multi-dimensional construct, the dimensions of which are positioned along a continuum at the extremes of which autonomous and controlled motivation are placed. While autonomous motivation implies the adoption of behaviors owing to the intrinsic value associated with it (e.g. the pleasure of feeling safe while working), controlled motivation translates into the adoption of safe behaviors due to the extrinsic value of the performed action (e.g. because of economic incentives associated with the adoption of safe behaviors). In this study, the antecedents of safety motivation are analyzed in accordance with the multi-dimensional nature of the construct. Namely, it is assumed a differentiated impact of motivation antecedents on the basis of the analyzed kind of motivation: autonomous or controlled. With this regard, the Self-Determination Theory (Deci & Ryan, 2000) has been recently implemented in a safety-related study, in which it was found that controlled and autonomous safety motivation have a differentiated influence on safety outcomes, such as safety performance (Jiang & Tetrick, 2016). To be specific, it was found that when workers have high levels of autonomous safety motivation they are more prone to adopt positive safe performances, while controlled safety motivation is associated with negative safety performances. According to Neal and Griffin's model (2006) safety-related organizational values have a direct impact on workers' safety motivation, which in turn have an influence over safety task and contextual performances. With this regard, it is assumed that workers' perception of organizational safety values are influenced by the perceived quality of PPE. This association, then, is assumed to translate into differentiated levels of safety motivation on the basis of the overall perception of organizational safety values.

## 3. The mediational role of organizational safety values

In literature, safety values are referred to workers' perception of organizational policies, practices and procedures related to workplace safety (Neal & Griffin, 2006). In other words, perceived safety values can be considered as the perception of workers about the levels of attention that organizations pay to safety. Scientific evidence underlines that safety values and safety climate positively predict workers' safety performance. To be specific, the perception of high levels of safety values and climate directly influence the voluntary adoption of safe performances (Colley et al., 2013). This association was confirmed, for example, in the Italian context: Barbaranelli et al. (2015) found that safety values (and, more broadly, safety climate) are positively associated with higher levels of safety motivation and knowledge, which in turn positively predict safety compliance and safety participation of workers (Barbaranelli et al., 2015). This evidence is in line with Griffin and Neal's model (2006), according to which, organizational factors related to safety (i.e. safety values and climate) are the distal antecedents of safety performance of workers. According to the model, safety values positively predict worker's safety motivation, resulting in better safe performances and participation. In line with previous studies and models, it is assumed that the perception of positive safety values directly influences workers' motivation to voluntarily adopt safer behaviors at work. Furthermore, in line with the model, it is assumed that safety values have a positive impact only on autonomous motivation: literature evidence confirms the role of voluntariness as a key motivational factor at the base of safe performances, thus not including perceptions of external pressure to work safely (Jiang & Tetrick, 2016). The following hypothesis are:

*H1: Organizational safety values are positively associated with autonomous safety motivation of workers*

*H2: Organizational safety values do not have an influence over controlled safety motivation of workers*

#### 4. The perceived quality of PPE as a distal antecedent of safety motivation

PPE usage represents a significant struggle for organizations due to the lack of safety compliance by workers. Indeed, many factors influence the adoption and usage of PPE at work. For example, the availability or the lack of comfort/fit of PPE represents potential obstacles to their usage in daily work (Lombardi et al., 2009). The low levels of compliance in PPE usage is really problematic, since it represents a relevant source of protection from potential hazards (Ahmad et al., 2017). When usage of PPE is low, workers are exposed to serious hazards that may translate into serious health implications (Ahmad et al., 2016). Although numerous contributions on factors influencing the usage of PPE are available in literature, to date, no studies have been conducted with the aim of analyzing the overall perception of workers about PPE and the associated impact on other psychological variables related to safety performance. To be specific, PPE quality is expected to influence the perception of workers about organizational safety values. Empirical evidence for this assumption derives from the economic field. Concerning customers' behaviors and attitudes, a recent study has shown that high-quality perception of a product has a direct impact on customers' trust towards the producing company, which in turn translates into customer loyalty towards the specific brand (Marakanon & Panjakajornsak, 2017). Another similar evidence is shown in Pahlevi and Suhartanto (2020) research, in which a positive association between the perceived quality of eco-friendly products with customer satisfaction, trust and loyalty was found (Pahlevi & Suhartanto 2020). Taken together, these findings show that the perception of quality is a fundamental aspect to consider in order to enhance the overall commitment towards the organization. On the one hand, the perception of quality raises consumer trust towards the producing company and, on the other, it favors loyalty towards the brand. Translating this evidence in the organizational safety field, it is possible to assume that PPE perceived quality influences workers' perception of the organization safety concerns. In other words, workers who perceive a higher quality of PPE provided by their company, will be more inclined to consider the company as more interested in safety related themes or, in other words, they will have a positive perception of organizational safety values. Thus, we assume that organizational safety values mediate the relationship between perceived PPE quality and autonomous motivation. We also assume that this mediational process is non-significant for controlled motivation. Accordingly, the following hypothesis are:

*H3: Organizational safety values mediates the relationship between perceived PPE quality and autonomous motivation*

### 5. Method

#### 5.1 Participants and Measures

Three companies were the context of this study. The three companies were from different sectors: energy, waste, and logistic. The sample consisted of 425 workers; 49% of them worked from zero to fifteen years in the organization and 11% had a role in safety practices (e.g., emergency team). 61% of participants had small accidents without absence from work and 34% accidents with at least a day of absence from work.

A structured anonymous questionnaire was used to collect the data. The questionnaire was administered in pencil-and-paper format. The participants completed the questionnaires privately and voluntarily in the workplace. The study assured respondents anonymity and confidentiality and, to guarantee anonymity of the participants, age and gender were not included as questions in the survey. The quality of the protective equipment was measured with two items that considered their availability and adequacy. The self-determined safety motivation scale (Mariani et al., 2015) was adopted to measure controlled and autonomous safety motivation. In more detail, controlled motivation was measured with the six items from extrinsic (i.e. if I don't work safely I risk a reprimand) and introjected (i.e., I feel bad about myself when I don't work safely) safety motivation scales and the autonomous motivation with the six items from identified (i.e., I value working in a safe environment) and intrinsic (i.e., I have fun while working safely) safety motivation scales. Safety values were assessed using two items adapted from the short form of Neal and Griffin's measures (Neal & Griffin, 2006). The items were focused on company's values (e.g., "My company considers safety to be important."). Response scales of every item were structured on the basis of a five-point Likert type. To assess the psychometric properties of the scales, the Alpha of Cronbach index was computed (Kline, 2000). Cronbach's alpha estimates the reliability of a psychometric test and can be considered as the expected correlation of the two tests that measure the same construct. The theoretical value of alpha varies from 0 to 1, values higher than 0.7 are fair. Every scale of the questionnaire shows, substantially, good/excellent alpha coefficients in this research.

#### 5.2 Strategy of statistical analysis

SPSS software (version 25) was used. First, descriptive statistics and correlation analysis were performed, then to test the hypotheses, linear regression analyses was performed. Subsequently, the Preacher and

Hayes (2004) analytical approach was adopted to test the mediation hypothesis. Specifically, Model 4 of process' macro was used. Quality of protective equipment was included as an independent variable (X), safety values index was included as the mediator (M) and safety motivation variables were included as dependent variable (Y) in two different models (Figure 1). Means of ordinary least squares (OLS) regression analyses estimated total effects, direct effects and indirect effects, separately for controlled and autonomous safety motivation. The effect of the independent variable (qualitative of protective equipment) is displayed in the total effect; when controlling for the mediator variable (safety values), it is indicated in the direct effect. The indirect effect comprises the path over safety values. Power problems are mitigated by confidence intervals bootstrapping method (Hayes and Preacher, 2014).

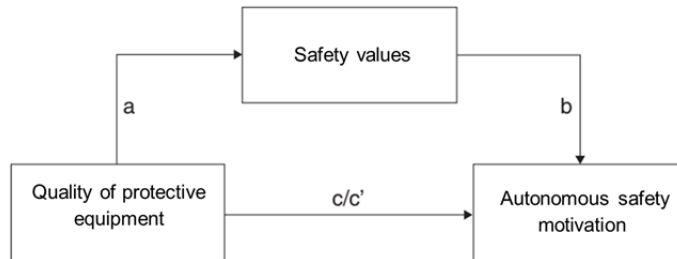


Figure 1 The mediation model: safety values (M) mediates the relationship between quality of protective equipment (X) and autonomous safety motivation (Y).

## 6. Results

Means, standard deviations and inter-correlations are presented in Table 1. Quality of protective equipment is related to safety values ( $r = 0.42$ ,  $p < 0.01$ ) and autonomous safety motivation ( $r = 0.20$ ,  $p < 0.01$ ), while it is not related to controlled safety motivation.

Furthermore, safety values are related to autonomous safety motivation ( $r = 0.25$ ,  $p < 0.01$ ), while it is not related to controlled safety motivation. Finally, both the motivation variables are associated each other ( $r = 0.27$ ,  $p < 0.01$ ).

Table 1: Means, standard deviations and intercorrelations among study variables

	Means	SD	1	2	3
1. Quality of protective equipment	4.01	0.92			
2. Safety values	4.04	0.93	0.42*		
3. Controlled safety motivation	3.09	0.85	0.03	0.08	
4. Autonomous safety motivation	4.31	0.65	0.20*	0.25*	0.27*

Note. \*.  $p < .01$

Table 2: Estimated coefficients for mediation models.

	Controlled Motivation	Autonomous Motivation
<i>Total effect</i>		
C	0.024	0.145
SE	0.046	0.035
95% CI	[-.067, .115]	[.076, .222]
<i>Direct effect</i>		
c'	-0.007	0.088
SE	0.051	0.038
95% CI	[-.108, .092]	[.013, .163]
<i>Indirect effect</i>		
Ab	0.031	0.057
SE	0.022	0.020
95% CI	[-.011, .076]	[.021, .099]

In the sample, the total effects of mediation analyses indicated a relationship between quality of protective equipment and autonomous safety motivation, with direct and indirect (via safety values) effects. On the contrary, results do not show a relationship between the quality of protective equipment and controlled safety motivation (Table 2). Accordingly, overall hypothesis is confirmed. In particular, first hypothesis is confirmed since organizational safety values positively predict autonomous motivation. Furthermore, no association between safety values and controlled safety motivation was found, confirming the second hypothesis. Finally,

safety values mediate the relationship between perceived PPE and autonomous motivation, confirming the third hypothesis.

## 7. Discussion

This study, laying within the wide context of the “human factor” as antecedent of workplace safety, considers the influence of organizational safety values and workers’ perceptions of personal protective equipment (PPE) on safety motivation. If perceived safety values can be considered as indicators about the relevance given to workplace safety by the organization, this study confirms that their role is fundamental in different ways. First, positive safety values can boost autonomous safety motivation of workers, making them more inclined to comply with safety norms and procedures. This result, in particular, is in line with Neal and Griffin’s model (2006), according to which safety-related organizational factors (such as safety values) can positively boost workers’ motivation to work safely. Second, no effects of safety values on controlled motivation were found, confirming that, when workers feel that the adoption of safe behaviors is externally regulated, organizations’ safety concern does not affect their motivation to work safely. Third, safety values play a mediational role between perceived quality of PPE and autonomous motivation. This evidence is in line with economic studies, according to which the quality of a product directly impacts customers’ trust and loyalty towards the brand. In the organizational safety field, this assumption implies that the quality of PPE is directly associated with workers’ perception of organizational safety values. High-quality PPE are, in this sense, a key factor contributing to workers’ motivation to work safely and to comply with safety norm and procedures.

We acknowledge that this study is not without limitations. First, the validity of results obtained through self-reported measures (such as surveys) relies on the subjective perceptions of participants. With this regard, a relevant limitation concerns the use of self-reported measures as the only source of information. However, surveys still represent best method to ensure anonymity of participants, a relevant issue to be considered for the topic of this study. With the aim of overcoming this limitation, future research should focus on gathering data from multiple sources, in particular, by ensuring the use of objective measures. Second, the correlational design of this study prevents from establishing strong causal relationships between considered variables. Future research should focus on designing longitudinal studies in order to better understand causal relationships between variables and their changes over time. Finally, the sample is limited to specific industrial companies: accordingly, future research should expand it through the examination of broader organizational contexts.

Concerning the practical implications, they are clear: if workers perceive a higher quality of PPE provided by their organization, they will have a positive perception of organizational safety values. Therefore, investing in high-quality equipment, on the one hand, and providing suitable information/training that helps to understand the quality of the equipment, on the other hand, becomes one of the instruments with which organizations can promote their safety values and create a security culture (Mariani et al., 2018). This theme touches a sore point in safety training. Many studies have showed that it is an important preventive measure (Freitas & Silva, 2017) and an effective way to modify workers’ behaviors (e.g. Robson et al., 2012), but an open debate about the efficacy conditions still remains, especially regarding safety soft-aspects such as values and motivation. A further practical implication entails strategies aimed at enhancing the perception of managerial support regarding DPI and organizational justice, which may significantly prevent the occurrence of counterproductive work behavior, such as unsafe behaviors, sabotage, and workplace bullying (e.g., Guglielmi et al., 2017).

This study enhances the knowledge concerning the role played by DPI perception and safety values in order to determine autonomous safety motivation, which in turn could be related to lower levels of injuries and accidents in the workplace and higher levels of health and safety in companies. This study is in line with previous evidence which showed the relevant role of intrinsic safety motivation for determining safety-related outcomes after a safety intervention (Ricci et al., 2016). The highlighted process in this study which starts with the perception of DPI, influencing values and finally, autonomous motivation to safely operate, strengthens the “human factor” role as antecedent of workplace safety.

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