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Speaking Up about Workplace Safety: An Experimental Study on Safety Leadership

Andrea Bazzoli ^{1,2,*} , Matteo Curcuruto ² , James I. Morgan ², Margherita Brondino ³ and Margherita Pasini ³

¹ Department of Psychology, Washington State University Vancouver, 14204 NE Salmon Creek Ave, Vancouver, WA 98686, USA

² Leeds School of Social Sciences, Leeds Beckett University, Leeds LS1 3HE, UK; m.ma.curcuruto@leedsbeckett.ac.uk (M.C.); jim.morgan@leedsbeckett.ac.uk (J.I.M.)

³ Department of Human Sciences, University of Verona, Lungadige Porta Vittoria, 17, 37129 Verona, Italy; margherita.brondino@univr.it (M.B.); margherita.pasini@univr.it (M.P.)

* Correspondence: andrea.bazzoli@wsu.edu

Received: 23 July 2020; Accepted: 8 September 2020; Published: 10 September 2020



Abstract: In this study, we test whether different types of safety leadership styles predict different employees' change-oriented discretionary communications about safety (i.e., safety voice) after controlling for proactive personality disposition to improve organizational sustainability. Building upon a multidimensional model of safety voice, which attempts to conceptualize different ways in which employees make suggestions about safety procedures, we developed four realistic scenarios in which we manipulated the supervisor's safety leadership style, including: (1) transformational safety leadership, (2) transactional safety leadership, (3) passive safety leadership, and (4) control group (i.e., no leadership at all). We randomly assigned 103 participants to two of four scenarios and measured four facets of safety voice and proactive personality dispositions. The findings showed that after controlling for the respondents' proactive personality, transformative safety leadership predicted *promotive* safety voice, transactional safety leadership predicted *preventive* safety voice, and passive safety leadership predicted *hostile* safety voice. These findings have a number of implications for our understanding of safety leadership and employees' safety communications.

Keywords: safety voice; leadership; experimental design; risk management; sustainable HRM

1. Introduction

Despite the advancement in workplace safety, Eurostat [1] estimated that in 2017 alone a total of 3552 fatal workplace accidents and 3.3 million occupational injuries that resulted in four or more days of absence occurred in Europe. Although the trend is downward, these numbers highlight the need to address the factors that are believed to contribute to those rates and design effective interventions to reduce them. More importantly, these rates may reflect an evolution of the sustainability theory from the classical triple bottom line (i.e., people, planet, and profit, reflecting social, environmental, and economic sustainability; [2]), to the inclusion of occupational health and safety into the sustainable organization paradigm. Notably, voluntary compliance with international safety and health standards (see e.g., the ISO 45,000 series), in addition to compliance with regulations (e.g., the Health and Safety at Work Act), is becoming more relevant for organizations worldwide. Furthermore, interesting applications of organizational sustainability that include a focus on occupational safety are the lean 6S methodology [3], which aims at reducing waste in the production process, and green chemistry [4], which aims at reducing the use of toxic chemicals and chemical waste. Although there are reasons to believe that it would be worthwhile for “green” to include “safe”, environmental sustainability

has often been considered as a means of improving profitability, and safety is often considered a background concern, in spite of numerous calls (see e.g., [5]) for the workplace to be considered not only from an occupational health perspective, but overall health promotion. In sum, we argue that decreasing unsafe behaviors and increasing safe ones is a pillar of social sustainability [6].

Safety research has shown that the most important antecedents of workplace accidents are managerial and organizational [7–9]. Leaders' behavior and decision making have been shown to affect the safety behaviors of subordinates [10–13] and several types of leadership can be leveraged to achieve a more sustainable organization [14]. However, Willis et al. [15] noted that the type of leadership that is effective in a context where safety is a priority and employees face hazards may differ from leadership styles that work where the perception of risk and hazard is lower. For this reason, safety scholars have investigated leadership in safety-critical environments in addition to leadership in safety-noncritical environments.

Constructive forms of leadership (i.e., transformational leadership; [16]), which highlight inspiring and motivating behaviors, have been found to predict several safety outcomes [11,17]. Another form of constructive leadership relevant for safety research is transactional leadership, which consists of acts of monitoring, vigilance, and error correction [11]. There is evidence that supports its role in fostering safety climate and safety behaviors [18,19]. On the other hand, research on destructive leadership behaviors and their potential negative effect on safety conduct is underdeveloped, despite the potential disastrous consequences for subordinates, work-teams, and organizations as a whole [20]. In particular, laissez-faire (a kind of destructive leadership) seems to not have an effect on safety behaviors [20,21].

This paper makes a number of contributions to the extant literature on safety voice: (a) we introduce a functionalist perspective on the safety voice construct, (b) we show that different leadership styles are uniquely associated with distinct categories of safety voice, and (c) we add to the very limited experimental literature on safety leadership by implementing an experimental vignette study.

This contribution is organized as follows: we first make the argument for the differential influence of different safety leadership styles on different facets of safety voice (an important typology of participative behavior by employees, which aims to support workplace safety management in organizations) [22–25], and then, test our hypotheses by means of MANCOVA. Our findings' implications for research and practice are discussed at the end of this contribution.

2. Safety Voice: Theoretical Foundations

Safety voice can be defined as a behavior that seeks “to improve safety by identifying current limitations and possibilities for positive change” [17], p. 105. Safety researchers have conceptualized this construct mostly as unidimensional [17,26,27] in contrast with the literature on the general construct of employee voice, which has been conceptualized as multidimensional [28], and more than 12 forms of employee voices have been identified [29].

We tend to generally agree with the position that safety voice could be conceptualized as a unidimensional construct [26,30]. However, in order to contribute to the advancement of our understanding of the construct, in the present study, we intend to approach safety voice from a functionalist perspective that stems from the literature on multiple forms of employee voice. We propose that safety voice could be categorized into different subdimensions according to their functions, aligning the conceptual framework of safety voice with the more general employee voice. As a general conceptual framework, we identified four functional elements of safety voice according to two criteria: (a) time perspective and (b) defense vs. challenge focus. The latter refers to the conceptual difference between preserving the safety system and procedures (i.e., sustain and defend them) and actively challenging them (i.e., question and correct the current state of affairs; [31]). The former draws from the notions of dynamic safety capability and future orientation in the management of organizational safety [32,33]. Therefore, this conceptual taxonomy distinguishes four functions of safety voice in the workplace: (a) challenge/future-oriented behaviors are defined as promotive safety voice; (b) defense/future-oriented behaviors are defined as preventive safety voice; (c) defense/present-oriented

behaviors are defined as prohibitive safety voice; and (d) challenge/present-oriented behaviors are defined as hostile safety voice.

Promotive safety voice is defined as a voluntary communicative act that aims to functionally improve safety procedures by changing what is currently being done and moving the organization toward an incremental improvement of its safety systems [32]. Preventive safety voice is defined as a voluntary communicative act that aims at expressing personal concerns linked to working situations that are due to contingent factors that go beyond human intentionality (e.g., fatigue, mechanical or procedural errors; [24]). In some regulatory frameworks (i.e., the European Union), reporting unsafe working conditions is considered mandatory, while it is not in others. Prohibitive safety voice is defined as a voluntary communicative act that aims at reporting safety concerns that arise from intentional unsafe behaviors and/or stopping a colleague that is carrying out such behaviors. This type of safety voice partially overlaps with whistleblowing, but it is conceptually broader as it includes acts that try to stop careless behaviors, which seems to prevail in many routine tasks in high-reliability organizations, despite managerial supervision [25,34]. Last, hostile safety voice is defined as the voluntary expression of derogatory and hurtful comments regarding safety procedures or safety management. This may entail some form of conflict with the organization or within the work unit, as research has shown that employees may actively resist, ignore, or reframe safety messages [35].

Safety Voice and Organizational Sustainability

As noted in the introduction, scholars traditionally approached the relationship between safety in the workplace and organizational sustainability from an engineering perspective, although others have recognized that human factors are indeed relevant for organizations' ability to sustain themselves in the future [36]. It follows that valuable human resource management strategies may contribute and promote firm performance (i.e., economic sustainability) by motivating, empowering, and ultimately, developing employees [37]. Research on voice behaviors has shown that having employees openly talk about issues in the workplace protects organizations against the negative effect of resentment and anger [38], improves organizational agility [39], prevents knowledge and skill loss, and promotes customer acquisition; all of which contribute to the organization's economic sustainability.

However, the impact of voice is likely to go beyond mere economic considerations. Social sustainability is defined as the process of generating the social health and wellbeing of organizational members [32]. On the one hand, safety citizenship behaviors (including safety voice) are negatively related to safety violations [40], hence improving employees' physical safety and wellbeing. On the other hand, safety voice can influence organizational purpose and values: specifically, co-creating values and a purpose is likely to lead to higher degrees of engagement and satisfaction. This, however, is only possible if employees do speak up, because if they remain silent, values and purpose may be decided unilaterally by management [41].

Relatedly, the relationship between employees and their leader may be paramount in promoting sustainability because of the strong influence leaders have on subordinates' behavior [11,17,22]. Leadership development programs may also benefit the organization by making it more socially sustainable. Additionally, employees' open communication regarding workplace safety issues could contribute to create a more sustainable environment because of a more proactive approach to risk prevention and to the incremental improvement of organizational safety systems and procedures. In the next section, we outline several arguments as to how safety leadership may influence different safety voice behaviors.

3. Hypotheses Development

Earlier studies on safety leadership were mainly focused on relationship aspects in the workplace, such as supervisory concern and managerial consideration for employee wellbeing [42,43]. Subsequently, other contributions started to analyze how different leadership styles, like transformational, transactional, and passive leadership, may have a distinctive impact on workplace safety [11,12,44]. The present

study, linking different supervisors' safety-specific leadership styles to different employee safety voice behaviors, relies upon self-regulatory focus theory and self-concept theories of leadership [45]: in broad terms, the theory maintains that the leader's regulatory focus predicts leadership style, which, in turn, predicts followers' behavior.

Transformational leaders encompass the dimension of individualized consideration, i.e., the leader shows consideration for employees' personal and professional growth and listens to followers' concerns and needs. In addition, Bass [16] theorized that the leader influences followers' behavior through idealized influence (i.e., by being a role model) and inspirational motivation (i.e., articulates a vision that is relevant for employees). These leaders are thought to influence subordinates' behavior through the psychological mechanism of personal identification and social identification with the work group [45,46]. Employees adopt the values shown by the leader as their own and align with the group. In the context of safety-critical industries, studies have demonstrated that safety-specific transformational leadership enhances occupational safety outcomes such as safety climate, safety consciousness, safety behaviors, and improved safety communication [10,17,47,48]. Clarke [11] confirmed these findings meta-analytically across a wide range of industries and occupations.

Kark and colleagues [45,46] showed that transformational leadership primed a promotion regulatory focus in followers, and that focus predicted several behaviors, such as creativity. Furthermore, transformational leaders intellectually stimulate employees to take new perspectives to challenge the status quo, which, translated into the safety realm, means that employees should be more likely to speak up to suggest changes to current safety systems. Empirical findings suggested that transformational leadership had a positive effect on voice behavior [49], creativity, and innovation [50]. Additionally, Conchie and her colleagues [17] noted that previous studies measured general transformational leadership, and while there are reasons to believe that general and safety-specific transformational leadership operate in similar ways, they are not synonymous [12]. Scholars also found that safety-specific transformational leadership predicts promotive safety voice behavior, mediated by two dimensions of trust [17]. Thus, based on the aforementioned arguments and research findings, we propose that:

Hypothesis 1. *Supervisor's safety-specific leadership style will have an effect on promotive safety voice. Particularly, the adjusted mean will be higher in the transformational leadership condition.*

According to Bass' taxonomy [16], transactional leaders employ two main styles, namely contingent reward and management-by-exception-active (MBEA). Leaders therefore clarify expectations and rewards and monitor employees' behavior, taking corrective actions when needed (but prior to the occurrence of serious incidents). Research on the effects of safety-specific transactional leadership is limited, compared to transformational leadership, but studies have found that transactional leadership is associated with rule-based compliance and safety participation [11]. There is empirical evidence that safety-specific transactional leadership has beneficial effects on several outcomes (e.g., leader effectiveness and followers' satisfaction with leadership behavior) and fewer injuries [13]. In addition, self-regulatory focus theory suggests that the leader's preventive focus should predict noncreative repetitiveness, vigilance, and accuracy [45]. In the broad safety literature, it is recognized that transactional leaders provide room for error recovery and learning [9]. This is particularly true in organizations working in high-risk environments, such as nuclear power plants and the railway industry: they aim to reach a high level of standardization to avoid system failure and thus, ensure safety. This entails that individuals and leaders must be both aware of the risks and procedure-compliant [51]. In other words, the focus of such organizations is on prevention of system failure [52], rather than innovation and transformation [32]. Taken together, empirical evidence and theory suggest that:

Hypothesis 2. *Supervisor's safety-specific leadership style will have an effect preventive on safety voice. Particularly, the adjusted mean will be higher in the transactional leadership condition.*

Empirical research supports the claim that general transformational leadership has a positive effect on whistleblowing attitudes [53] because transformational leaders encourage followers to act ethically, even though this is in contrast with the organization's guidelines or culture [54]. There are also reasons to support the claim that general transactional leadership style has also a positive effect on whistleblowing attitudes because a transactional leader focuses on vigilance and correcting mistakes; therefore, employees may not fear retaliation from reporting a colleague's wrongdoings because they perceive they are helping the leader in monitoring and preventing mistakes [53]. In addition to this, it has been argued that extrinsic rewards and punishments may also have an effect on promoting whistleblowing [55]. Research shows that transformational leadership is the prevalent predictor of whistleblowing attitudes, when compared to transactional leadership [53]. However, these findings come from organizations in which safety is not critical and they analyzed general transformational and transactional leadership, thus it may be difficult to generalize these findings to safety-critical organizations. Nevertheless, it makes sense to hypothesize that employees that decide to report a colleague who is working unsafely may be motivated by the idea that they are helping the leaders in their efforts to monitor safety systems and correct followers' mistakes. Consequently, the following hypothesis is advanced.

Hypothesis 3. *Supervisor's safety-specific leadership style will have an effect on prohibitive safety voice. Particularly, the adjusted mean will be higher in the transactional leadership condition.*

On the other hand, passive leaders either take action after a serious problem occurred (i.e., management-by-exceptions-passive) or lack leadership capacity completely (i.e., laissez-faire). This approach is typified in passive indifference about tasks, employees, safety, and the ignorance of problems. The impact of this kind of leadership has not been studied extensively and passive leaders generally act only when a safety-related event occurs or when a safety-related situation reaches a level of severity that is no longer ignorable or when the only available choice is to act [48]. Passive leadership is generally recognized as non-effective in safety-critical environments because it is reactive in nature and thus, the leader gives little to no direction to followers in terms of safety [8]. Organizations with passive leaders experience lower levels of safety climate and higher rates of accidents [13], along with diminished safety behaviors, lack of compliance to safety procedures, and diminished participation in safety issues [44]. It is therefore clear that passive leaders show a lack of safety strategy and commitment to safety. Additionally, there is evidence that passive leadership may create frustration and stress within the workgroup, which may result in interpersonal tensions and conflict [20]. In turn, experiencing conflict in the work environment may lead to counterproductive work behavior [56]. These empirical findings therefore suggest that:

Hypothesis 4. *Supervisor's safety-specific leadership style will have an effect on hostile safety voice. Particularly, the adjusted mean will be higher in the passive leadership condition.*

Predictive models of proactive behaviors in safety research usually encompass two main sets of predictors, namely individual and contextual factors [7,57,58]. This contribution focuses on one contextual factor, namely the supervisor's safety-specific leadership style. However, when trying to establish causality, it is important to control for confounding variables that may affect the tested model. Among individual differences, personality factors play an important role in predicting proactive motivational states and proactive behaviors [57]. Research stemming from the concept of personal initiative [59], work design theories [60], organizational change [61], and career development [62] aimed to explain employee's agency in shaping their tasks, roles, and jobs. However, it has increasingly been recognized that all these themes may have a common ground: proactive personality may be the determinant of proactive behavior across a wide range of domains.

A proactive person may be defined as someone that has a relatively stable behavioral tendency to initiate change in their environment [63]. This implies that, according to this conceptualization,

individuals are proactive across multiple contexts and over time, regardless of the particular situation. For these reasons, it seems useful to adjust the experimental manipulation setting to control for any differences that existed before the experimental manipulation was administered (i.e., employee proactive personality).

Hypothesis 5. *Previous findings (i.e., hypotheses 1 through 4) will hold after controlling for respondent's proactive personality disposition.*

4. Method

4.1. Participants

Following ethical approval granted by Leeds Beckett University, we asked 10 small-medium enterprises in Italy to participate in the current study. All employees were classified as blue-collar workers by their respective employer. One-hundred-and-three participants were recruited. Fifteen percent of participants were female, and participants were aged 21–63 ($M = 39$, $SD = 10.69$). In line with industry trends in Italy, a large majority of the respondents had a permanent contract (92%) and overall, more than half (55%) of the sample worked for their employer more than 10 years.

4.2. Scenarios Description

The authors created four scenarios featuring a fictional manufacturing plant and a fictional shift leader. These scenarios were constructed bearing in mind three different safety leadership styles (i.e., transformational, transactional, and passive; [16]) and a control group, in which only a fictional plant, but no leader, was present. There, a few work-related events happened. These were held constant across the scenarios and were selected from the Occupational Safety Health Administration (OSHA) definition of work-related precipitating events and injury. They included slipping, falling, and being struck by an object, one of which resulted in a colleague being brought to the emergency room.

Following this description, the scenario gave a brief overview of the fictional supervisor's leadership style, including everyday examples of behaviors that would reflect differential leadership styles. For instance, the transformational leader "was happy when colleagues expressed a potential way to change operations that improved safety in the unit", while the transactional leader believed that "if safety procedures ain't broke, don't change them" and was "attentive to anomalies, errors, and deviations from safety procedures". Conversely, the passive leader "waited until things went bad before actually doing something" and after all, "he did not care about safety issues in the unit". The full scenarios are available from the first author, upon reasonable request. Additionally, other contextual details were provided to help provide as much context as possible, to improve realism, and minimize the potential that responses were not artificial [64,65]. These scenarios were tested in a pilot study and underwent manipulation checks that are presented in the results section.

4.3. Research Design and Procedure

The experimental vignette methodology (EVM) consists of presenting participants with carefully constructed and realistic scenarios to assess change in dependent variables across groups [66]. In doing so, we will be able to experimentally manipulate leadership style while also enhancing experimental realism, which is often cited as one of the major drawbacks of lab experiments [67]. It follows that both external and internal validity are enhanced using this methodology [68].

Each participant was asked to read two semi-randomly assigned scenarios, so that no one could receive two copies of the same scenario (as recommended by Aguinis and Bradley [66]). We chose to assign two scenarios to each participant because when participants are presented with only one scenario (a complete between subject design), they are not able to make any comparison, which would help them in grounding their responses contextually. Without another vignette to serve as reference for their own judgment, responses may not accurately reflect the true judgements of each respondent.

Hence, administering two scenarios to each respondent seemed a reasonable tradeoff between the risk of demand effect (i.e., participants figured out the true scope of the study and could alter their answers accordingly) and the documented negative effects, including measurement problems, that arise when participants only rate one scenario [66].

Research assistants distributed the informed consent form, the questionnaires, and scenarios to participants at the end of their work shifts (see Appendix A for a sample scenario). Participants were asked to read two scenarios and rate the frequency of several safety voice behaviors that they thought they would enact in that specific scenario. As a control variable, participants were asked to also rate themselves on a proactive personality scale.

4.4. Measures

Appendix A shows the items administered along with the original scale from which they were taken. All items were associated to a 7-point Likert scale. Promotive safety voice was measured by four items taken from the Simard and Marchand scale [69] and the Hofmann et al. safety initiative scale [21]. Preventive safety voice was measured by four items taken from the Hofmann et al. [26] and Tucker and Turner [27] voice scales. Prohibitive safety voice was measured by three items taken from the whistleblowing scale developed by Hofmann et al. [21] and one item from the voice scale used by Tucker et al. [70]. Hostile safety voice was measured by four items adapted from the Maynes and Podsakoff scale [29]. Proactive personality disposition was measured by four items used by Parker et al. [58] (sample item: *No matter what the odds, if I believe in something, I will make it happen*).

4.5. Data Analysis

ANOVA seems to be the dominant approach to analyze experimental data in organizational research and social sciences [71]. However, all ordinary least squares (OLS) techniques rely on the assumption of independence of observations [72], which is likely to be violated in our sample due to the fact that we asked participants to rate two different scenarios. Therefore, our data have a nested structure and should be analyzed accordingly.

Following Aguinis and Bradley [66], we specified a priori the number of participants. To estimate the minimum number of participants needed to achieve an acceptable power, we ran a Monte Carlo simulation using Clarke's [11] meta-analytic estimates as population values. Since no meta-analytic estimates of the relationship between safety leadership and safety voice were available, we selected a similar outcome, safety participation, for which the estimates were available. Power was over 0.90 with 100 participants.

5. Results

5.1. Pilot Study and Manipulation Checks

To verify to what extent the scenarios reflected the underlying leadership style, we conducted a pilot study with a small sample of 20 employed students enrolled in a master's program in emergency management and 37 employees from a construction firm in Italy. First, we conducted a cognitive interview with the student-workers sample, probing to what extent they perceived the fictional leader to conform to one of the known safety-specific leadership styles. After analyzing the data, we edited the scenarios accordingly.

We then randomly assigned each construction employee to a specific scenario and asked them to rate the fictional leader behavior using a slightly modified version of the MLQ-5x scale [73]. After data collection, we ran a MANOVA using the fictional leader theoretical leadership style as our IV and the measured transformational, transactional, and passive leadership styles as our DVs. We found a significant difference between mean vectors (Pillai's trace = 0.98, $F(3, 32) = 580.65$, $p < 0.001$). We found evidence that each scenario univocally reflected the theoretically assigned safety-specific leadership style.

5.2. Preliminary Analyses

As a prerequisite of testing hypotheses, the authors assessed the quality of the measurement model. It should be noted that the standard single-group CFA has been estimated only for the purposes of obtaining estimates for reporting reliability indices, because it is clear from the research design that there are groups (i.e., the scenarios) in the sample that can be modeled explicitly and the research goal is to test differences between them.

We ran a series of CFAs to test the measurement model and three alternatives. The hypothesized measurement model described in the introduction (i.e., the functionalist approach) had a second-order factor (safety voice) and four first-order factors, corresponding to the four functions. The first alternative model (Model 2 in Table 1) posits that the four safety voice categories are indeed four different, first-order, factors [29]. The second alternative model (Model 3 in Table 1) encompassed two first-order factors, named future- and present-oriented safety voice. The former factor merged promotive and preventive safety voice, while the latter merged prohibitive and hostile safety voice. The following alternative model (Model 4 in Table 1) was similar to the previous model, but promotive and hostile safety voice items were merged into the challenge-oriented voice, while preventive and prohibitive safety voice items were merged into the defense-oriented safety voice. The last alternative model (Model 5 in Table 1) merged all items into a single latent factor. As noted in Table 1, models were compared via a Chi-square difference test.

The hypothesized measurement model fitted considerably better than alternative models 2, 3, and 4; however, there was no significant difference in fit between the hypothesized model and alternative model 1. Since alternative model 1 is more parsimonious (i.e., less parameter estimates and more degrees of freedom), this is the measurement model that should be retained. Factor loadings for each indicator and the correlations between latent constructs are reported in Figure 1. McDonald's omega coefficients were 0.83, 0.81, 0.80, and 0.94, respectively. The proactive personality scale omega coefficient was 0.85.

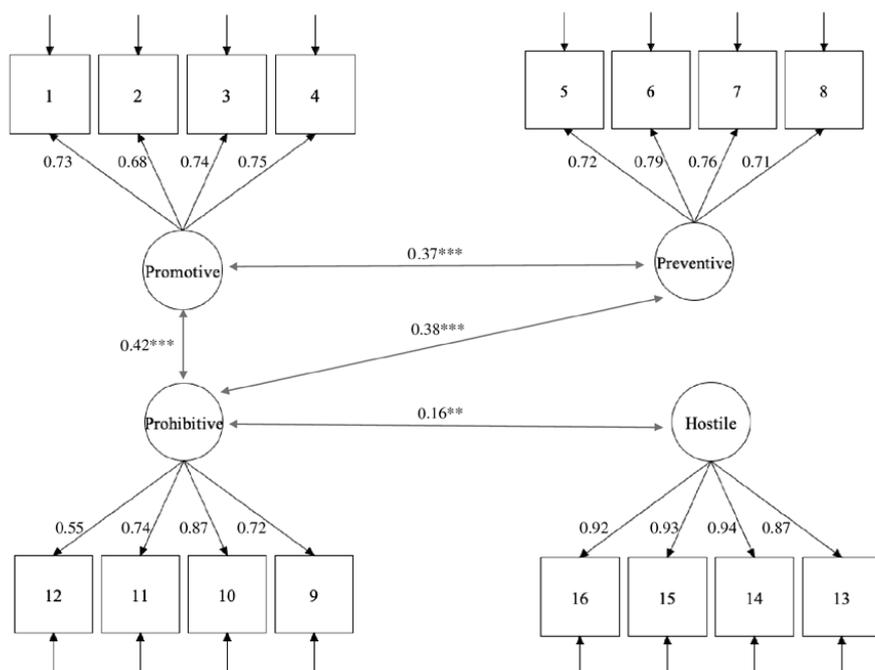


Figure 1. Safety voices measurement model.

Table 1. Measurement model test.

Model	χ^2	df	CFI	TLI	RMSEA	SRMR	Comparison	$\Delta\chi^2$
1. Hypothesized measurement model	213.37	100	0.94	0.93	0.07	0.06	—	—
2. Alternative model 1 (four first-order factors)	209.41	98	0.94	0.93	0.07	0.05	1 vs. 2	3.96 (ns)
3. Alternative model 2 (two first-order factors, present and future voices)	736.21	103	0.66	0.61	0.17	0.18	3 vs. 1	522.84 ***
4. Alternative model 3 (two first-order factors, challenge and defense voices)	1316.91	103	0.35	0.25	0.24	0.20	4 vs. 1	1103.54 ***
5. Alternative model 4 (single factor)	1475.46	104	0.27	0.16	0.25	0.21	5 vs. 1	1262.09 ***

Note. χ^2 = Chi square; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual; $\Delta\chi^2$ = change in chi square. *** $p < 0.001$.

5.3. Experimental Results

To check whether the nested structure of data may have a role in the effects we hypothesized, we computed a set of intraclass correlation coefficients (ICC) as a means of calculating the degree of non-independence in our data. Scholarly guidelines suggest that coefficients higher than 0.05 imply a small to medium effect of the nested structure; therefore, it is best to estimate the models using multilevel modeling [69]. Conversely, there is a consensus among scholars that ignoring the nested structure of data when ICC is lower than 0.05 has negligible consequences [72,74–76]. In order to compute ICC for each dependent variable (i.e., four types of safety voices), we estimated four mixed-effects models, specifying each dependent variable as a fixed effect and participants as random effects. The ICC for promotive safety voice was 0.006, the coefficient for preventive safety voice was 0.009, the coefficient for prohibitive safety voice was 0.001, and the coefficient for hostile safety voice was 0.005. Therefore, we chose to disregard the nested structure of data and compute a multivariate analysis of covariance (MANCOVA). Additionally, such coefficients provide evidence of successful manipulation.

The zero-order correlation matrix is presented in Table 2. The assumption that covariates should not be highly correlated (i.e., $r < 0.80$) is met. Residuals were normally distributed and the variances/covariances homogeneity test was not significant.

Table 2. Zero-order correlations.

	1	2	3	4
1. Preventive Safety Voice	–			
2. Promotive Safety Voice	0.30 **	–		
3. Prohibitive Safety Voice	0.33 **	0.35 **	–	
4. Hostile Safety Voice	0.00	0.00	0.16 *	–
5. Proactive Personality	0.33 **	0.29 **	0.06	–0.07

Note. * $p < 0.05$, ** $p < 0.01$.

We conducted a reality check [77], asking participants to rate from 1 (completely irrelevant) to 10 (completely relevant) how realistic and relevant to their day-to-day work the scenario was. The average response was 8.66 (SD = 0.93), indicating that participants perceived the scenarios to be realistic. A one-way MANCOVA was conducted to determine a statistically significant difference between the fictional leadership styles in the scenario on promotive, preventive, prohibitive, and hostile safety voices controlling for the respondent's proactive personality. We found a significant effect of safety leadership on safety voice, $F(12, 524) = 23.14$, $p < 0.001$, Wilks' $\lambda = 0.32$, partial $\eta^2 = 0.31$. Particularly, the univariate ANCOVAs showed a significant effect of the fictional supervisor's leadership style on (a) promotive safety voice after adjusting for respondents' proactive personality $F(4, 201) = 10.26$, $p < 0.001$, partial $\eta^2 = 0.21$; (b) preventive safety voice after adjusting for respondents' proactive personality $F(4, 201) = 24.29$, $p < 0.001$, partial $\eta^2 = 0.33$; and (c) hostile safety voice after adjusting for respondents' proactive personality $F(4, 201) = 30.51$, $p < 0.001$, partial $\eta^2 = 0.38$. There was no significant effect of the fictional leadership styles in the prohibitive safety voice scenario after adjusting for respondents' proactive personality $F(4, 201) = 0.96$, $p = 0.43$. All post hoc tests were run using the Bonferroni correction for familywise error rate. The estimated mean differences, standard errors, and 95% CI are reported in Table 3.

Table 3. Pairwise comparisons.

IV Level of Interest	Comparison	Mean Difference	SE	95% CI	
				LL	UL
Promotive Safety Voice					
Transformational Leadership	Transactional Leadership	0.96	0.18	0.49	1.43
	Passive Leadership	0.50	0.18	0.03	0.96
	Control	0.62	0.18	0.15	1.09
Preventive Safety Voice					
Transactional Leadership	Transformational Leadership	1.30	0.16	0.86	1.73
	Passive Leadership	0.58	0.16	0.15	1.02
	Control	0.72	0.16	0.28	1.16
Hostile Safety Voice					
Passive Leadership	Transformational Leadership	2.60	0.30	1.81	3.39
	Transactional Leadership	2.58	0.30	1.77	3.38
	Control	2.85	0.30	2.04	3.65

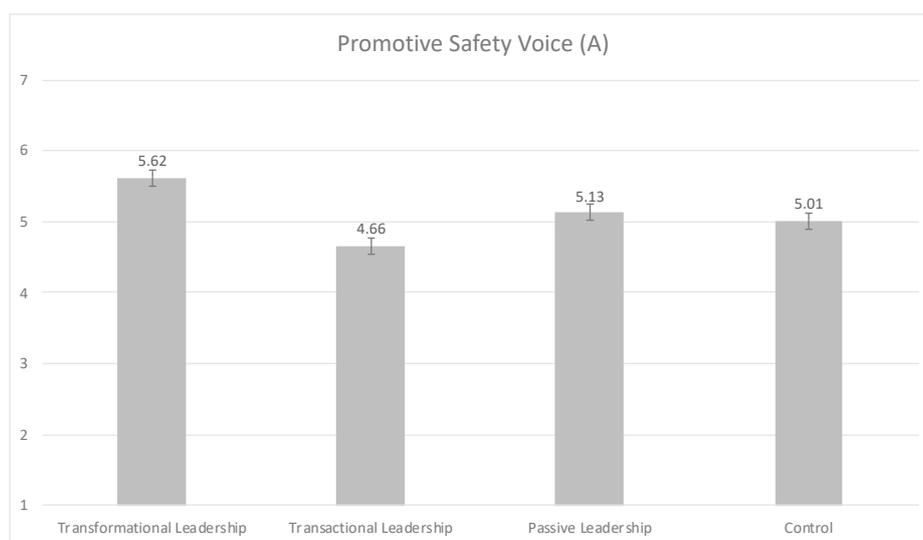
Note: Only the comparisons of theoretical interest are reported. LL = 95% CI lower limit, UL = 95% CI upper limit.

Figure 2A shows the estimated marginal means of promotive safety voice across leadership styles after controlling for the respondent's proactive personality. Post hoc tests showed there was a significant difference between transformational leadership and (a) transactional leadership ($p < 0.001$), (b) passive leadership ($p = 0.03$), and (c) control group ($p < 0.001$). Hypothesis 1 is then confirmed.

Figure 2B shows the estimated marginal means of preventive safety voice across leadership styles after controlling for the respondent's proactive personality. Post hoc tests showed there was a significant difference between transactional leadership and (a) transformational leadership ($p < 0.001$), (b) passive leadership ($p < 0.001$), and (c) control group ($p = 0.003$). Hypothesis 2 is then confirmed.

Figure 2C shows the estimated marginal means of prohibitive safety voice across leadership styles after controlling for the respondent's proactive personality. As noted above, there was no significant effect of safety leadership on safety voice, which is confirmed by the very little discrepancy between marginal means across the different leadership conditions.

Figure 2D shows the estimated marginal means of hostile safety voice across leadership styles after controlling for the respondent's proactive personality. Post hoc tests showed there was a significant difference between passive leadership and (a) transformational leadership ($p < 0.001$), (b) transactional leadership ($p < 0.001$), and (c) control group ($p < 0.001$). Hypothesis 4 is then confirmed.

**Figure 2.** Cont.

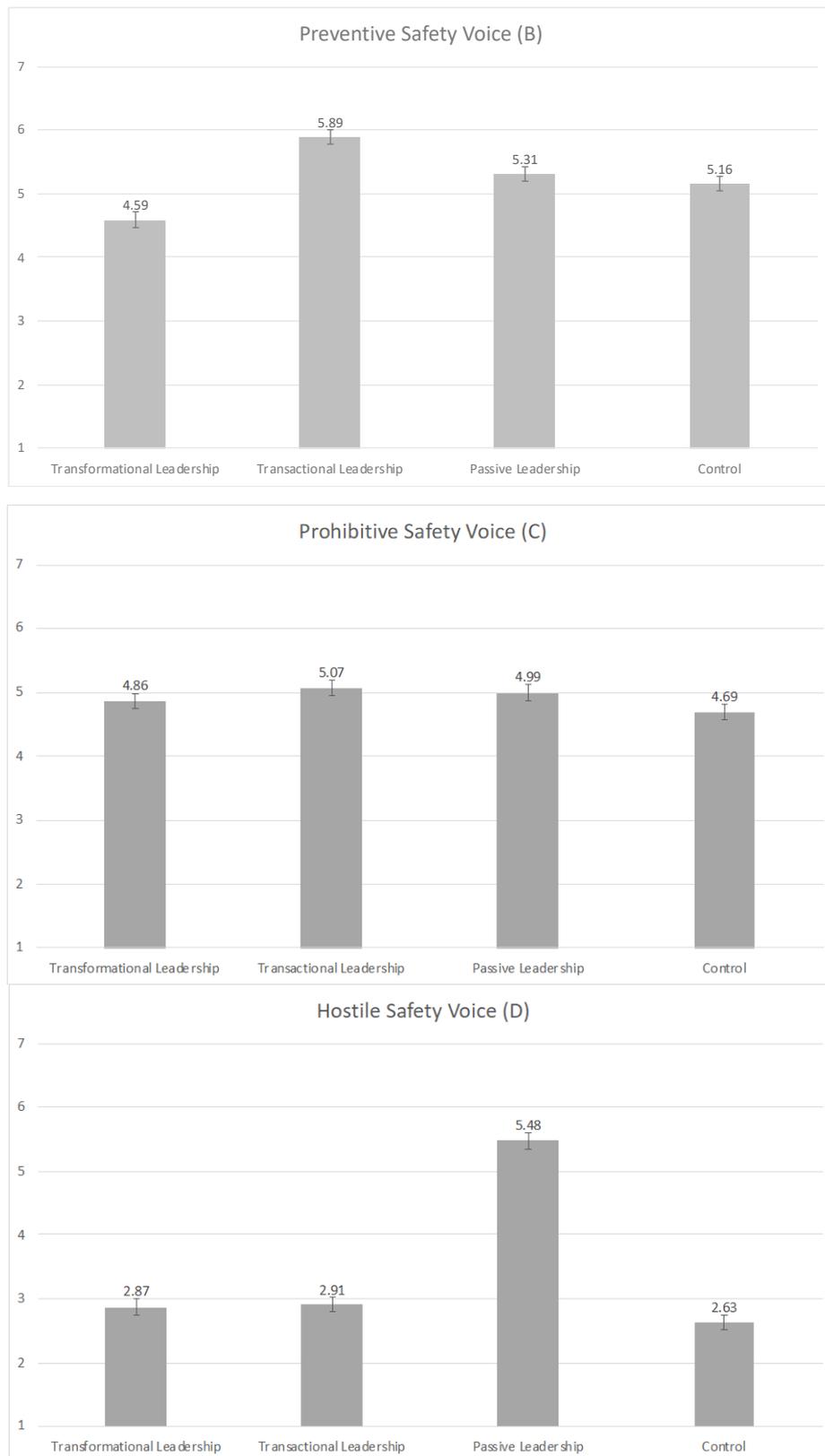


Figure 2. Safety voices estimated marginal means after controlling for proactive personality.

6. Discussion

Safety voice has received extensive scholarly interest in research carried out in safety-critical environments (see e.g., [78,79]). Drawing from the extant literature, we implemented an experimental vignette study to test whether different leadership styles have distinct effects on four types of safety voice, controlling for respondents' proactive personality disposition. After running several ANCOVA statistical tests, we found several significant effects which confirm some of our original research hypotheses. The results suggested that safety leadership had a significant effect on promotive safety voice after controlling for respondents' proactive personality. Particularly, participants in the transformational safety leadership condition showed significantly higher levels of promotive safety voice, compared to participants in the transactional, passive, and no leadership groups. These findings are in line with the broader safety literature, which suggests that transformational leadership leads to better safety outcomes [11], and also regulatory focus theory [46]. This theory posits that leader's regulatory focus is primed on subordinates' regulatory focus, developing a mechanism that explains how transformational leaders influence followers' motivations, behaviors, and ultimately, organizational outcomes. Additionally, this process seems to be effective beyond the role of followers' personal characteristics, such as proactive personality disposition, lending support to the claim that contextual and organizational factors may be more likely to affect this process, rather than internal states or dispositions.

Our results showed also that leadership style had a significant effect on preventive safety voice after controlling for respondents' proactive personality disposition. In particular, participants in the transactional safety leadership condition showed significantly higher levels of preventive safety voice, compared to participants in the transformational, passive, and no leadership groups. Again, these results may be explained by regulatory focus theory [45], in that transactional or monitoring leaders are more likely to have a conservative regulatory focus, which is then primed on followers, who, in turn, enact behaviors aimed at preserving and defending the current safety system. Therefore, the leaders' attentiveness to negative outcomes (i.e., errors and deviations from safety norms) and preference for stability (i.e., not changing/improving the safety system if things work just fine) will lead to preventive safety voice behaviors. It should be noted that reporting unsafe behaviors may be a legal requirement in some jurisdictions, and indeed, this is the case in Italy, where this study took place. We are not able to clearly predict what role the legal framework may have played in participants' answers because we did not control for their actual knowledge of safety legislations.

We did not find a significant effect of safety leadership on prohibitive safety voice, although there are theoretical and empirical reasons to believe that both transformational and transactional leadership styles may affect whistleblowing attitudes [53]. As noted above, this study was conducted in a country with a strong safety legislative framework; hence, reporting unsafe behaviors and stopping those behaviors may have been a legal obligation for our participants. This argument is strengthened by the consideration that Caillier and Sa [53] investigated for whistleblowing intentions in federal agencies in the United States, which offer considerably weaker protections for whistleblowers, if any at all [80]. Thus, we suggest that legislative frameworks may have a direct impact on prohibitive safety voice behaviors, in line with the wider literature on safety outcomes, which has shown that regulatory systems indeed have an effect on safety behaviors [81].

Last, our results support the hypothesis that safety leadership had a significant effect on hostile safety voice after controlling for respondents' proactive personality disposition. In particular, participants in the passive safety leadership condition showed significantly higher levels of hostile safety voice, compared to participants in the transformational, transactional, and no leadership groups. Drawing social psychology research on intergroup relations, in their classical experiment, Sherif et al. [82] identified leadership as a key factor in intergroup relations. Passive leadership is most likely not a state of zero-leadership, rather it is the nonfulfillment of legitimate expectations. Consequently, passive leaders, through their ignorance or absence, are associated with high group conflict levels. To our knowledge, only Skogstad et al. [20] investigated the role of passive leadership and group

conflict, finding a moderately positive relationship. Our results are in line with the literature because hostile safety voice may be interpreted as a sign of a clear conflict between employees that are voicing their dissatisfaction with safety management and their leader, or management.

6.1. Implications for Research

This contribution adds to the limited body of experimental research on safety leadership and safety voice. By experimentally manipulating safety-specific leadership, we demonstrated that different leadership styles are associated with distinct functional categories of safety voice. Additionally, our CFA results seem to provide empirical support for a typological conceptualization of safety voice, which considers the four categories of the construct introduced in our experiment, not only as complimentary distinct forms of safety voice, but indeed as four distinct behaviors, more independent from each other than originally claimed on the basis of the current literature on safety voice [83]. First, the CFA model suggested that a superordinate model (i.e., a model with a second-order factor) does not fit the data better than a typological model. Second, the zero-order correlations showed that the four types of safety voices are significantly different from each other, although they overlap to some extent. This overlap, however, does not seem to be a strong enough justification to conceptualize safety voice as a unidimensional construct, considering both psychometrics and organizational theory, as the current literature suggested. Instead, these findings could support a typological approach to the construct of safety voice. In other words, this perspective holds that different forms of employee voice ought to be investigated as separate constructs, as opposed to unidimensional approaches (see e.g., [29]).

In light of this initial and partial empirical evidence, we encourage scholars to investigate safety voices as distinct constructs, rather than as functions of a unitary higher-order construct. It would follow that if these are indeed different constructs, they may have different antecedents and outcomes. A reconceptualization of safety voice as a multidimensional construct is also in line with the literature on the general construct of voice [29]. We suggest that future research on safety voice may consider drawing systematic models, which take into account the differences between the distinct typologies of safety voice introduced in the present study.

Thirdly, our results showed that different safety voices are predicted by different safety-specific leadership styles, supporting the claim that safety leadership is not to be interpreted as a unique predictor for a unique construct. This contribution began to explore differential predictors for safety voices, highlighting the need for a more in-depth empirical research investigating the set of differential predictors. Last, we showed that the effect of leadership on safety voices goes beyond the role of dispositional factors. In fact, this contribution shows that contextual factors (e.g., regulatory environment) may have a more prominent role compared to employees' proactive personality.

6.2. Implications for Sustainable HR Practices

Our study has implications for practitioners with regards to the supervisor's leadership role in fostering some types of safety voices. Our findings suggest that certain leadership styles predict certain forms of safety voice; therefore, organizations may find it beneficial to implement safety leadership training initiatives for their supervisors that focus on specific facets, rather than relying on general interventions or just transformational leadership [84]. These findings are in line with those of Clarke and colleagues [11,18], which showed the importance of focusing on a broader range of leadership behaviors. For instance, industrial contexts characterized by high levels of complexity and interdependency of work processes (e.g., chemical and petrochemical industries) are more exposed to risks that can be difficult to predict, even with the most accurate design of safety regulations and work activities [32,85]. In such contexts, managerial programs aiming to reduce uncertainty in sources of risk should consider stimulating employees' preventive voice by planning supervisory training focused on improving transactional leadership. Conversely, in organizational environments with a relatively low level of organizational safety systems maturity, managerial interventions targeting transformational leadership may be more crucial to stimulate the incremental improvement of organizational safety [86].

The results of our experimental study can be informative for organizations to set up more systematic intervention strategies to improve safety communication in the workplace, training work-team leaders in recognizing the distinct typologies of safety voice behaviors that can be necessary to promote (or defend) workplace safety in a given organizational situation. They can also be trained to understand how they can stimulate a specific voice behavior by adjusting and modifying their leadership style in line with situationally specific safety goals. This, for example, may include coping with unpredictable sources of risk [52], improving the safety of work-team activities [22], or increasing the reliability level of an organizational procedure [32].

Safety management strategies may be impacted by the finding that the effect of safety leadership is relevant after controlling for employees' proactive personality disposition: it is vital for organizations hoping to foster any kind of safety voices to know that employees pay close attention to their supervisor's behavior and are influenced by it. Thus, it may not be completely relevant for organizations to focus only on more proactive employees; rather, consideration should be given to other organizational factors that may foster communication, such as a leader's behavior, organizational justice, and trust. For instance, from a practical perspective, this may mean that human resource programs aimed at promoting open safety communication in the workplace should perhaps not be weighted towards recruitment and selection strategies based on measured levels of dispositional personality. Instead, human resource managers should consider allocating their budget and organizational resources towards the diagnosis of existing safety leadership capabilities in their organization, in order to help team leaders, fostering their potential to correctly interpret, address, and lead the safety communication dynamics of their teams.

In accordance with past studies that have shown that change-oriented and affiliative safety behaviors may predict distinct outcomes for organizations [32,87], we also suggest that organizations might benefit from implementing managerial strategies to identify and record the propensity for their employees to engage in specific types of safety voice, as opposed to treating it as a unidimensional construct. As an example, constructive suggestions (promotive voice) to improve a specific procedure may enable a company to significantly improve the productivity and reliability of work processes in a team or a department, whereas expressing or reporting a potential hazard (preventive voice) might be crucial in order to proactively prevent a negative event. The distinction between the different typologies of safety voice described in our study could be embedded in the preexisting, formal risk-reporting system of a company and be associated with specific reward systems aimed to reinforce and encourage employees to engage in a specific kind of voice that may lead to relevant benefit for that company, not necessarily associated with the prevention of accidents, but also with the improvement of broader work processes.

6.3. Limitations and Future Research

Although this paper offers several valuable contributions to safety voice and leadership research, some limitations should be acknowledged. First, although we adopted several steps to enhance the realism of this study (i.e., pilot testing, having participants complete the questionnaire during working hours, providing accurate and detailed baseline information, and measuring how they related to the proposed scenario), this study could be improved by using more immersive technology, such as virtual reality. Nonetheless, we are confident that our findings are generalizable beyond the experimental scenario because of the high degree of realism we were able to incorporate in this contribution [66]. In fact, much like transfer of training is improved by enhancing similarity between training conditions and actual job context [88], improving realism by increasing the similarity between the vignette and participants' natural setting increases the observed effect [89]. Additionally, we were not able to assess within-person change due to the consideration that presenting participants with too many scenarios could lead to fatigue [90].

Second, these findings should be replicated in a natural environment, perhaps using a correlational study to account for actual leader's behavior to further substantiate our findings. Future studies

across different industrial contexts should aim to verify if the factorial distinction of the different typologies of safety voice is constant across different frameworks characterized by specific work activities, team-working processes, uncertainty avoidance, power distance, and other cultural values, such as individualism versus collectivism principles [91]. Moreover, it would be relevant to replicate this study in countries with different regulatory environments (e.g., the USA, Australia, China) to effectively evaluate the influence of contextual variables—beyond national culture—on the stability and the distinctiveness of the four factor dimensions of safety voice, and their links with different elements of safety leadership. If future studies confirm the generalizability of the findings of our experimental study, it might be more correct to advance the notion of multiple employees' safety voices in the workplace, rather than a single unidimensional construct of safety voice.

Third, our focus was on three well-known safety-leadership styles, but although this is frequently the case for leadership research, other leadership behaviors should be included, such as empowering, authentic leadership, and coaching, which have been shown to be effective in safety-critical organizations [87,92–96]. Even if the distinction between transformational and transactional leadership styles has been a dominant driver of research in the fields of organizational psychology, the analysis of the influence of other elements of leadership in the workplace might be significant for a better understanding of the group dynamics related to safety communication in the workplace. Additionally, other research contributions [84] have shown that leaders do not always endorse and enact a specific leadership style but rather switch between known leadership styles, in what has been defined as inconsistent leadership. Future research should investigate whether inconsistent leadership behaviors have the same effect on safety voice.

Last, although we controlled for respondents' proactive personality disposition [58], other individual characteristics should also be taken into account. For instance, alternative theoretical frameworks on proactivity—other than the dispositional approach considered in the present study—may offer useful insights to explain how people engage in different typologies of safety voice. Future studies, for instance, should investigate which motivational processes are elicited by distinct safety leadership styles and how these motivational drivers are differently associated with distinct typologies of safety voice. For instance, the 'proactive motivation' model proposed by Parker and colleagues considers three distinct motivational processes affecting proactive behaviors like employee voice, including 'reason to', 'can do', and 'energized to' motivations [57]. A valuable extension of our work could consider how these motivational processes prompted by leaders' daily actions in the workplace may stimulate the distinct types of safety voice of their subordinates. An investigation of the mediational role of the distinct motivational drivers of proactivity, we believe, will greatly improve our understanding of how employees react to different leadership behaviors.

7. Conclusions

The relationship between leadership styles and safety voice has traditionally been limited to the investigation of the effect of transformational leadership on promotive safety voice. The results of the current study suggest that safety voice is better conceptualized as multiple behaviors that represent different constructs, as opposed to a unitary construct. In addition, our findings seem to support the claim that different types of safety voices are impacted by different leadership styles.

Author Contributions: Conceptualization, A.B., M.C., and M.P.; Formal analysis, A.B.; Funding acquisition, J.I.M.; Investigation, A.B.; Methodology, A.B., M.C., and M.B.; Supervision, M.C., J.I.M., and M.P.; Writing—original draft, A.B.; Writing—review and editing, A.B., M.C., J.I.M., and M.P. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Acknowledgments: The authors would like to thank Mark Griffin for the initial scientific conversations that inspired the development of this paper. This contribution is partially based on A.B.'s master's thesis, which was conducted under the supervision of M.C. (director of studies) at Leeds Beckett University.

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

Appendix A

Appendix A.1 Safety Voices Items

Dimension	Description	Scale
Promotive Safety Voice	Making suggestions to supervisor for improving safety of the work environment	Simard and Marchand, 1995
	Putting pressure on the supervisor for improving safety of the workplace	Simard and Marchand, 1995
	Trying to change policies and procedures to make them safer	Hofmann et al., 2003
	Making suggestions to improve safety to the local safety representative	Adapted from Hofmann et al., 2003
Preventive Safety Voice	Raising safety concerns during planning sessions	Hofmann et al., 2003
	Raising safety concerns to the local safety representative	Adapted from Hofmann et al., 2003
	Remind coworkers to take precautions	Tucker and Turner, 2011
	Tell the supervisor about hazardous work	Tucker and Turner, 2011
Prohibitive Safety Voice	Explaining to other crew members that I will report safety violations	Hofmann et al., 2003
	Reporting crew members who violate safety procedures	Hofmann et al., 2003
	Telling new crew members that violations of safety procedures will not be tolerated	Hofmann et al., 2003
	Telling my colleague who is doing something unsafe to stop	Tucker et al., 2008
Hostile Safety Voice	Bad-mouthing the organization's safety policies	Adapted from Maynes and Podsakoff, 2014
	Making insulting comments about safety-related initiatives.	Adapted from Maynes and Podsakoff, 2014
	Making overly critical comments regarding how safety issues are managed in the organization.	Adapted from Maynes and Podsakoff, 2014
	Making overly critical comments about the organization's safety procedures	Adapted from Maynes and Podsakoff, 2014

Appendix A.2 Sample Scenario (Transactional Leadership)

You're working for quite some time for a heavy industry organization in the Veneto region, producing heavy pieces of equipment for specialized machines. During the last month you noticed that some accidents and incidents happened to your work group: for instance, a colleague of yours slipped on misplaced pincers while another ended up at the local ER because he cut himself while using a board cutter machine. Yet another colleague experienced a minor injury on the job because he got hit by a piece of material falling out of a telescopic handler.

John is your work unit supervisor and has a clear approach to safety matters: he believes that "if it ain't broke, don't fix it"; in other words, he's not an innovator and is keen to follow the safety procedures. This is done in two ways: John has always explained the safety rules that need to be followed and what you all have to do in order to get rewarded for safety. He always congratulates employees that work safely. In addition, he assiduously checks your behavior against the published safety norms. As a consequence, John focuses on irregularities, mistakes, exceptions, and deviation from safety norms. If there are any safety issues, he intervenes promptly. It happened that Sam, a newly hired colleague of yours, was driving a forklift in the wrong way and John immediately took action to correct it.

The other scenarios are available from the corresponding author upon reasonable request.

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