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Employee Safety Motivation: perspectives and measures on the basis of the Self-Determination theory

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Key words

Workplace safety; Self-determination theory; psychometric properties

Parole chiave

Sicurezza sul lavoro; Self-determination theory; qualità psicometriche

Summary

Background: *There is a growing body of literature demonstrating that employee's safety behaviour is e largely influenced by their motivation to work safely. The Self-Determination Theory, which proposes a multidimensional conceptualization of motivation, is now established in various domains of the academic field (Healthcare, Education, Psychopathology, Organizations, Sport etc.). However, there are few publications concerning its use in the analysis of motivation in a safety context, where it constitutes a new topic of study.* **Objective:** *The aim of this study was s to develop and validate the Italian version of the Self-Determined Safety Motivation Scale and analyze the psychometric properties of the scale in terms of construct validity.* **Methods:** *The research involved 387 Italian employees from three companies, who occupied medium-low levels in the organizational hierarchy.* **Results:** *A good level of psychometric properties was shown.* **Conclusion:** *The Italian version of the Self-Determined Safety Motivation Scale is a reliable and valid instrument to assess safety motivation.*

Riassunto

«Motivazione alla sicurezza sul lavoro: prospettive e misure sulla base della Self-Determination theory». **Introduzione:** *Vi sono importanti varie ricerche che dimostrano come i comportamenti di sicurezza siano influenzati dalla motivazione a lavorare in sicurezza. La Self-Determination Theory che propone una concettualizzazione multidimensionale della motivazione, è ormai affermata in diversi settori del campo accademico (assistenza sanitaria, istruzione, psicopatologia, organizzazioni, sport, ecc.). Tuttavia, ci sono poche pubblicazioni relative al suo impiego nel contesto della sicurezza sui luoghi di lavoro, dove costituisce un nuovo tema di studio.* **Obiettivo:** *Lo scopo di questo studio è quello di sviluppare la versione italiana della Self-Determined Safety Motivation Scale, analizzandone le proprietà psicometriche scala in termini di validità di costrutto.* **Metodi:** *La ricerca ha coinvolto 387 dipendenti italiani, che occupavano livelli medio-bassi nella gerarchia organizzativa, provenienti da tre aziende.* **Risultati:** *I dati raccolti hanno evidenziato buoni livelli delle proprietà psicometriche.* **Conclusione:** *La versione italiana della Self-Determined Safety Motivation Scale è uno strumento affidabile e valido per valutare la motivazione della sicurezza nei luoghi di lavoro.*

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Introduction

The relationship between motivation and work injuries and accidents was confirmed by numerous studies that found that safety behaviour is associated with fewer injuries and accidents (e.g. 19, 20) and that some safety behaviour, voluntary safety behaviour (such as safety participation), is largely induced by motivation to work safely (e.g. 3, 13, 20).

Safety motivation could be described as an individual willingness to exert effort to adopt safety behaviour and the valence associated with that behaviour (19).

Do we really know if employees are motivated to adopt safety behaviour in workplaces? And how we can assess such safety motivation? These questions are highly significant since motivation is the starting point for implementing an action. In order to promote safety behaviour among employees in an efficient way, it is necessary to have a reliable tool to measure safety motivation. The purpose of this paper was therefore to produce a scale on safety motivation in Italian that uses the theoretical model of Self-determination theory.

The Self-Determination Theory (SDT) (6) is a popular psychological theory of human motivation and behaviour which outlines different types of motivation. Even if this theory is already established in the academic field and in many domains such as education, healthcare, psychotherapy, organizations, sports etc. (e.g. education: 22; healthcare: 26; organizations: 11), to date there are only two seminal publications investigating the contribution (e.g. 9, 28) that such an approach could offer in the safety domain, and it therefore constitutes a new topic of study in the workplace safety context.

The starting point of the theory is the concept of self-determination. To be self-determining means experiencing a sense of choice in initiating and regulating one's own actions (5). Based on this concept SDT proposes two overarching types of motivation: extrinsic and intrinsic. Extrinsic motivation means doing something for instrumental reasons, motivation depends on external factors and is the opposite of intrinsic motivation, which means doing something for its own sake. When individuals are extrinsically motivated, the outcome resulting from the behaviour is the underlying reason why the behaviour occurs; however these outcomes can diverge in how they affect behaviour, depending on how closely the outcome is linked with the values and goals of the employee (9). Individuals internalize the motivation for adopting different behaviour to varying degrees (11, 24). These two different aspects reflect two different strategies for improving safety in workplaces: behavioral-based safety initiatives and safety culture strategies (7). Behavioral-based safety programmes largely focus on motivating employees through contingencies (e.g., rewards), whereas developing a positive safety culture is more value-based and focuses on encouraging employees to internalize the value of safety (7).

Each type of motivation takes place on a continuum where amotivation, that is to say total absence of motivation (be it intrinsic or extrinsic), could be described as one extreme and total intrinsic and autonomous motivation the other. The continuum defined by the Self-Determination theory starts from amotivation and continues with different forms of extrinsic and intrinsic motivation, namely:

- External Regulation: in which people are motivated by obtaining a reward or by avoiding punishment. The value of the behaviour has not been internalized at all and people behave solely to comply with external rewards.
- Introjected Regulation: in which people are motivated by complying with a partially internalized contingency to gain pride and self-esteem or to avoid feelings of guilt and shame. In external regulation the pressure to perform adopt behaviour can come from another person (e.g. supervisor, coworker) or a group (e.g. organization). Introjected regulation still involves performing activities because there is pressure to do so; however the pressure comes from the employees themselves and is experienced through self-worth contingencies like ego involvement and guilt.
- Identified Regulation: in which people understand and endorse the personal values and significance of a certain behaviour and, as a re-

sult, experience a sense of freedom in doing it. Identification can involve finding meaning and choice in behaviour, even when faced with adverse circumstances, and corresponds to the tenets of existential thought (25). Identified regulation is guided by personal values and self-endorsed commitments. Identified people engage in behaviour because they perceive an action in accordance with their personal beliefs; however people do not respect rules because forced to but because they believe it is important to adhere to certain standards.

- Integrated Regulation: this is the most autonomous form of extrinsic motivation and refers to identifying with the value of an activity to the extent that it becomes part of a person's sense of self so that people have a full sense that their behaviour is an integral part of who they are.
- Intrinsic Regulation: people perform an activity because they perceive it as interesting, satisfying or pleasurable. Intrinsic motivation represents the fullest form of autonomous safety motivation. In Intrinsic forms of motivation, the reason for engaging in safety activity is completely volitional.

The various types of motivation could also be described as controlled motivation or autonomous motivation. Controlled motivation is driven by external pressure and this is the case of external and introjected motivation, whereas autonomous motivation means endorsing one's action at the highest level of internalization (10, 5, 23) and is the case of identified, integrated and intrinsic forms of motivation. The Self-Determination Theory therefore suggests that there are different types of motivation, such that people vary not only in level of motivation but also in the source of the quality of that motivation.

Self-Determined Safety Motivational Scale

Considering the theoretical framework of the Self-Determination theory, Fleming (9) developed a scale labelled Self-Determined Safety Motivation Scale (SDSM) in order to assess employee safety motivation. For the sake of creating a brief and practical measure, he chose not to include integration items since it has proved very difficult to psychometrically distinguish integration from identification (30).

By examining the literature on this theoretical framework, including the definition of each different type of motivation and other motivational scales already developed in other domains (e.g. education: 22; healthcare: 26), Fleming (9) identified a group of items suitable for creating a preliminary SDT safety motivational scale. Fleming's research was developed in two different studies with the intent to modify the tool in order to improve its internal validity and reliability. The first study assessed the construct validity of a 20-item SDSM scale in a group of 492 employees. Statistical analyses indicated that the hypothesized five factor model demonstrated a good fit with the data and showed the best fit with the data in comparison with other alternative models. Cronbach's Alpha was measured in order to test internal reliability showing that four of the five subscales exhibited an acceptable/good level of internal consistency.

On the other hand the reliability of the introjected dimension showed levels below adequacy.

A second study was therefore performed in order to answer the criticism raised by the first study, with the intention of finding a single subset of items that demonstrated high internal reliability for each type of safety motivation. This second research involved 446 employees from various companies operating in different domains and adopted a strategy based on exploratory structural equation modelling analyses to reduce the number of ambiguous items. The tool showed good validity and the five subscales of safety motivation demonstrated acceptable internal reliabilities (Intrinsic, α=0.79; Identified, α=0.78; Introjected, α=0.74 External, α=0.79; and Amotivation, α=0.69).

The findings of these studies provide evidence that safety motivation is a multidimensional construct, including different types of motivation which could be described as (1) Amotivation - a lack of motivation for working safely, (2) External safety motivation - contingency-based motivation

influenced by others in the environment, (3) Introjected safety motivation - internal pressure to work safely, (4) Identified safety motivation - personal value-based motivation, and (5) Intrinsic safety motivation - personal interest and enjoyment in safety activities.

In conclusion, the 16-item pilot scale developed by Fleming provides a starting point for future research using the Self-Determination Theory as a theoretical framework and, as the authors of the study suggested, future research should focus on confirming the factor structure and evaluating the validity of this scale.

Aims of the research

Currently only few tools exist in the literature that can measure safety motivation, especially if we consider tools that measure not just whether people are motivated or not, but how they are motivated. We especially wanted to adapt, test and validate the SDSM in the Italian language; so on the basis of Fleming's results, the main aim of this research was to create a brief and practical Italian version of the SDSM that measures the construct in a reliable, valid and efficient manner. In developing the current research we followed Fleming's suggestion to focus on the factor structure and evaluate the validity of the Self-Determined Safety Motivation Scale.

In accordance with APA regulations (14), psychometric properties will be investigated in terms of construct validity and in order to analyze dimensionality, reliability, convergent and discriminant validity.

Methods

Sample

Three organizations were involved in the research: one in the industrial sector analyzed by Fleming (9), energy (O1), and two were from different industrial sectors , engineering (O2) and environmental sector (O3).

A total of 387 employees took part in the study: 128 from O1, 125 from O2 and 134 from O3. They were all employed at a medium-low level in the respective organizational hierarchies.

As regards their involvement in work safety , 22% of participants declared they had a role of "supervisor in the safety domain", 3% were "delegates of the employees in the safety domain" and the remaining employees were workers without any specific role in safety. Also 32% of the participants declared they were "responsible in case of an emergency". Lastly , 60% of the employees had been in the organization for more than 16 years; 5% for 0-5 years, 14% for 6-10 years and 21% for 11-15 years.

Development of the SDSM scale

A preliminary interview was organized with 16 members of the higher level management in order to define the objectives and operating methods of the research.

Fleming's Self-Determined Safety Motivation Scale (SDSM) was used as the starting point in the development of an Italian measurement tool. The version of the scale created by Fleming was translated following the indications of Casillas and Robbins (1). The SDSM Scale was translated with a blind translation by two experts in the safety domain with good knowledge of the English language. Both translations were then compared in order to create a single Italian version. This first Italian version of the questionnaire was then re-translated into English in order to create a back version. This allowed us to check the correspondence of the Italian translation with Fleming's scale. Adjustments were made taking into account the back translation version and at a later stage the scale was re-translated into Italian.

At this point four focus groups with 36 members from the companies were organized in order to check the questionnaire translation and the clarity of the items.

Within the focus groups some items were found to be unclear or inappropriate. The Italian version was then transformed into a five-point Likert scale, as opposed to the former seven point likert scale of the English version. A five-point Likert scale not

only allowed uniforming the questionnaire with other scales, but in particular made it possible to take into account the observations of the focus group members, who expressed their difficulty in differentiating between too many points for each item.

Compared to the English version, the condition "absence of motivation" was removed since the focus groups considered it inappropriate to offer the possibility to declare no motivational interest in the safety domain. There are, in fact, SDT scales that do not include amotivation items and focus instead on active types of motivation (e.g. 11). Other items were eliminated or modified according to the degree to which the focus group members defined them as comprehensible and easy to answer.

As a result a 16-item 5-point Likert scale was obtained ranging from 1= do not at all agree, to 5= completely agree. The questionnaire was developed in order to measure different levels of extrinsic forms of motivation (four items, e. g. *Perché se non lavoro in sicurezza corro il rischio di un richiamo da parte dell'azienda*), introjected motivation (four items, e. g. *Per non avere sensi di colpa*), identified motivation (four items, e. g. *Perché per me la salute e la sicurezza è un valore*), and intrinsic motivation (four items, e. g. *Perché sono soddisfatto quando lavoro in condizioni di sicurezza*).

Statistical analysis plan

The sample was randomly divided into two groups. The first group (Group A) consisted of 194 participants and the second group of 193. Firms were proportionately represented between the groups. Group A was used to determine the primary factor structure using EFA, whereas Group B was used for the CFA.

Exploratory Factor Analysis was performed in order to analyze the dimensionality of the Scale and to select the items for each sub-scale. The method of extraction was Principal Axis Factoring, the criterion used in order to extract the numbers of the factors was placing Eigen values greater than 1 (also called Kaiser Method) and the rotation technique was direct Oblimin rotation.

CFA using maximum likelihood estimation was conducted on the Group B data to test the adequacy of the model that EFA had shown. As indicated in the literature (14) the following threshold values were used to define the quality of the CFA model: CFI ≥ 0.95 and RMSEA ≤ 0.08. Reliability was measured using Cronbach's alphas to make comparisons possible with other studies.

The majority of the statistics were performed using IMB SPSS Statistics 22. Path Analysis and Confirmatory Factor Analysis were performed using IBM SPSS Amos 22.

Results

Exploratory Factor Analysis

The Kaiser-Meyer-Olkin (KMO) value was 0.87, i.e., exceeding the value of 0.60 recommended by Kaiser (16). The KMO value is a measure of sampling adequacy showing that the patterns of correlation are relatively compact; thus, factor analysis should produce distinct and reliable factors. An Exploratory Factor Analysis was performed with sub-sample A in order to test the construct validity of the scale. The Kaiser method of extraction was considered and four factors were extracted, which were generally well defined by the variables. The four factors explained 61% of the variance and the Eigen value related to the fifth factor - extracted - was quite good. Oblique rotation was performed and, as seen in table 1, the results showed a generally good model described by the extraction of the factors. Each item showed a high correlation with only one factor and each factor showed high correlation with a small number of intended items.

In particular for the first factor saturations were higher for items J14, J16 and J13: the factor was labelled "Intrinsic Safety Motivation". For the second factor, items J6, J7 and J5 had the highest loadings: this dimension was labelled "Introjected Safety Motivation". For the third factor, items J1, J3 and J2 showed the highest loadings and it was called "External Safety Motivation". Finally, for the fourth factor, the loadings were highest for items J11, J12 and J9: the factor was labelled "Identified Safety Motivation".

Table 1 - Explorative factor analysis: pattern matrix (N=194). The table represents the Exploratory Factor Analysis loadings for each item of the SDSM scale into the four factors extracted. Only the factor loadings > |.10| are presented. The selected items are underlined. The sentences in brackets have been adjusted as a result of the focus-group

Original version	Italian version	1	2	3	4
In order to get approval from others (e.g., supervisors, colleagues, family, clients…)	J1 Perché viene richiesto dall'azienda/ superiori		-0.118	0.818	
In order to avoid being criticized by others (e.g., supervisors, colleagues, family, clients…)	J2 Per evitare di essere criticato dagli altri (e.g.. supervisor. colleghi. famiglia. clienti)		0.236	0.507	-0.118
(Because I risk losing my job if I don't)	J3 Perché se non lavoro in sicurezza corro il rischio di un richiamo da parte dell'azienda	-0.155	0.210	0.674	
(In order to get a reward)	J4 Per evitare infortuni	-0.108			0.632
(Because I take pride in working safely)	J5 Per non avere sensi di colpa		0.639	0.260	
Because otherwise I will feel guilty	J6 Perché altrimenti mi sentirei male con me stesso		0.912		
Because I feel bad about myself when I don't work safely	J7 Perché altrimenti mi sentirei in torto		0.792		
Because I feel good about myself when I work safely	J8 Perché mi fa sentire bene con me stesso	0.164	0.563	-0.136	0.177
(Because I personally value safety)	J9 Perché ritengo che un ambiente di lavoro sicuro abbia una grande importanza	0.412		0.169	0.442
Because putting effort into working safely is important to me.	J10 Perché metterci un particolare impegno nel lavorare in sicurezza ha un per me un significato personale	0.654		-0.134	0.117
Because I value working in a safe environment)	J11 Perché per me la salute e la sicurezza è un valore	0.219		-0.140	0.662
Because I believe it is important to put effort into working safely .	J12 Perché penso sia importante impegnarsi a fondo per lavorare in condizioni di sicurezza	0.449			0.538
Because I have fun while working safely	J13 Perché sono soddisfatto quando lavoro in condizioni di sicurezza	0.726			0.261
Because it makes me happy	J14 Perché provo soddisfazione nel lavorare in maniera sicura	0.943			
Because safety interests me	J15 Perché mi interessa la salute e la sicurezza	0.444			0.405
(Because I enjoy working safely)	J16 Perché mi rende orgoglioso di me stesso7	0.748	0.132		-0.168

Confirmatory Factor Analysis and Internal Consistency

After Explorative Factor Analysis, Confirmatory Factor Analysis was conducted on the Group B data to cross-validate the model of selected items. The 4-factor solution again provided an adequate fit for the data: considering the good fit indices of the whole model, the results were substantially good (CFI=0.95 and RMSA=0.075).

From figure1 it can be seen that correlations between the items and their intended factor were generally high. The highest correlations were found withinControlled Safety Motivation (between Extrinsic and Introjected motivation) and within Autonomous Safety Motivation (between Identified and Intrinsic motivation).

To evaluate the internal reliability and item-to-scale homogeneity of the SDSM scale, we calculated the alpha coefficients and mean inter-item correlations in the whole sample. The results showed that Cronbach's α coefficients ranged from a minimum of 0.764 to a maximum of 0.864. The means of inter-item correlation coefficients for the SDSM scales ranged from a minimum of 0.515 to a maximum of 0.680.

Table 2 shows the descriptive statistics of the four types of motivation. Values of skewness and kurtosis were mainly within acceptable levels for demonstrating multivariate normality, except for the case of Identified Motivation.

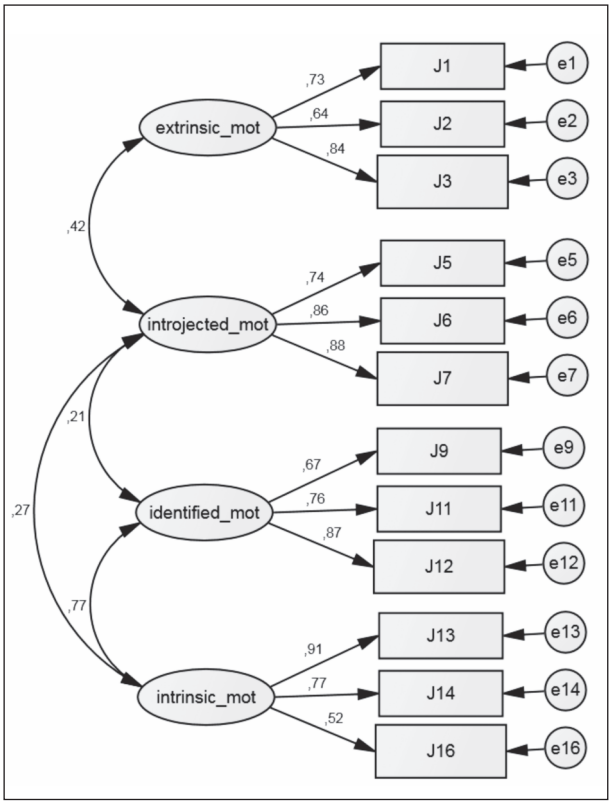

Figure 1 - Factor Structure of the Italian Self-Determined Safety Motivation Scale (Confirmatory Factor Analysis)

Table 2 - Reliability indexes and Descriptive Statistics of the four types of motivation (N=387). The table represents the reliability index (Alpha of Cronbach) and the descriptive statistics of the four factors that represents the four types of motivation (Employee Safety Motivation)

	Alfa of Cronbach	Mean Inter-item Correlation	Mean Statistic	Std. Deviation Statistic	Skewness		Kurtosis	
					Statistic	Std. Error	Statistic	Std. Error
External Motivation (J1, J2, J3)	0.762	0.515	2.59	1.05	0.23	0.12	-0.55	0.25
Intojected Motivation (J5, J6, J7)	0.864	0.680	2.88	1.29	-0.02	0.12	-1.10	0.25
Identified Motivation (J9, J11, J12)	0.819	0.601	4.49	0.64	-1.28	0.12	1.12	0.25
Intrinsic Motivazion (J13, J14, J16)	0.819	0.602	4.13	0.81	-0.96	0.12	0.91	0.25

Discussion

This study provides an initial test of the validity and the reliability of the Italian version of the SDSM scale based on self-determination theory. An extensive sample was assembled from several different industrial sectors, also extending the previous study by Fleming (9) .

Through Exploratory Factor Analysis a four factor solution emerged that explained a fair portion of variance. The four factors extracted with Factor Analysis substantially corresponded to the four dimensions that were supposed to be measured. The three items with the highest loading values were selected and used in a Confirmatory factor analysis, performed with a different subsample.

The confirmatory factor analysis verified the model and showed a framework of correlations in line with the literature: all items were correlated with their respective supposed factor; the highest correlations among factors were between Extrinsic and Introjected motivation, that is, the dimension of Controlled Safety Motivation, and within Autonomous Safety Motivation (between Identified and Intrinsic motivation). The research results are in line with those Fleming (9) found in his study.

Moreover, our findings are similar in terms of fit indices with Multidimensional Work Motivation Scale validation (MWMS; 12). There are many parallelisms between both scales. The content is very similar (e.g. focussing on the fact of being satisfied to measure intrinsic motivation; focussing on the concept of values to measure identified motivation; focussing on the concept of failure to measure introjected motivation etc.), the structure is very similar (three items for each subscale of the MWMS) and neither of the scales measures integrated motivation. This type of motivation was, in fact, originally included in the Self-Determination Theory as a form of extrinsic motivation. However previously published scales that contain an integration subscale show that it is statistically difficult to separate it from the identified and intrinsic motivation subscales (17, 29, 30). There are also some differences between the MWMS and the Italian Self Determined Safety Motivation Scale. The Italian Safety Scale does not measure amotivation as this was a special request by the participants of the focus groups that helped to develop the scale. Secondly the MWMS included external regulation items focusing on material rewards (e.g. money) as well as social rewards (e.g. praise).

Recently, Scott, Fleming and Kelloway (28) published an extended version of the SDSM that also includes Integrated motivation and develops the external motivation for safety on the basis of material rewards for employees (e.g. pay raise, promotion). These represent possible aims for further research.

However the main limits of the present research enable us to define the further steps of the validation process of SDSM Italian scale. The measure concerning the presence of amotivation could be analyzed in the fair work context where safety is not considered so important. Future research could be performed on a more varied sample of participants. Considering the fact that the main economic sectors involved in fatal and serious accidents at work in Europe are construction, manufacturing, transport and storage (8), it would be interesting to investigate safety motivation through the SDSM scale in companies that operate in these sectors.

Future research should also consider other motivational measures in order to test the concurrent validity of the scale, and should take into account specific indicators (e.g. number of accidents at work; severity of accidents, compliance safety performance and citizenship behaviour towards safety, etc.) in order to test the predictive validity of the scale in a longitudinal study (4, 13, 27). Finally, it could be interesting to analyze the relationship between safety motivation and work motivation, considering the mediation effect of attitude towards health.

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