

The Importance of Considering Emotions in the Development of Effective Safety Training Courses in the Food Industry

Marco G.Mariani^a, Michela Vignoli^b, Viviana Dibello^a, Rita Chiesa^a, Dina Guglielmi^b

^a Department of Psychology, University of Bologna, Viale Berti Pichat 5, 40127, Bologna, Italy

^b Department of Education Studies, University of Bologna, Via Filippo Re 6, 40126, Bologna, Italy

marcogiovanni.mariani@unibo.it

Wearing personal protective equipment (PPE), such as gloves in the food sector is a safety behaviour which can protect hands and fingers of workers from bruises, abrasions, cuts and punctures and prevent occupational diseases. Previous research has shown that the use of PPE depends on individual factors such (as personality and perceived benefits/barriers), interpersonal aspects (as social influence and social/group norms) and on organizational factors such as availability of and accessibility to PPE (e.g. Lu et al. 2015). However, although emotions play an important role in regard to the decision making of the people (e.g. Hogarth et al., 2011) and can affect perceptions of risk (e.g. Slovic, 2000), previous studies have not given importance to the emotional aspects related to the use of personal protective equipment (PPE) such as gloves. Thus, the aim of this study is to analyze the role of emotions in using gloves during their task performance in order to develop training courses which could effectively improve the use of gloves or other equipment. 133 workers and employees working in a warehouse were recruited for this research. The results showed that positive emotions in the use of gloves were related to motivation to the safety on safety compliance. Accordingly, the Agreement between State and Regions (2011), which states that the teaching methodology of safety training should privilege an interactive approach that involves the centrality of the worker, these results highlight the importance of considering positive and negative emotions in developing effective safety training courses.

1. Introduction

What do you feel when you fasten a seat belt in your car? Or what do you feel when you wear safety gloves for handling protection? If you ask people these questions you can collect different answers. Someone may answer "safe", "protected" but someone else may answer "tied", "limited" too. Employees can have different reactions and emotions when they adopt PPE and it is important to recognise them to improve their compliance behaviours. As a result, emotions have an important role in risk perception and in coping with hazardous situations (Slovic, 2000); more over the idea that emotion is related to behaviour has been established in psychology and has been asserted and verified in various forms by many theorists (Baumeister et al., 2007).

Safety in the workplace has been studied for several years in order to identify the factors able to facilitate continuous improvement. Research aimed at identifying the underlying causes of the accident phenomenon has, primarily, focused on technical issues, such as lack of personal protective equipment (PPE) and individual predisposition to injury and the hard variables of the workplace, such as structure and technology environments. Subsequently, studies focused on the dangerous behavior of individuals and human error, attributing to the single cause of the accident (Wallace and Vodanovich, 2003). Nowadays, the most widely supported model by scholars attributes injuries to multi-causal factors: injury is considered a symptom of the failure of the socio-technical system formed by the interaction including human - machine - social environment (Serpe and Cavazza, 2007).

However, the adoption of PPE is a key factor for injury prevention. PPE, such as gloves in the food sector, is a safety behavior which could protect worker's hands and fingers from bruises, abrasions, cuts and punctures and prevent occupational diseases. Concerning factors able to influence safety behaviors, such as the use of

PPE, psychological factors have been extensively studied. In fact, the use of PPE is not an automatic compliance of company rules but it is a behavior that can be influenced by more determinants that Lu and colleagues (2015) gathered in three categories: individual factors, interpersonal determinants and organizational factors.

At an individual level, in agricultural industry, the use of personal protective equipment, regarding farmers use during handling of plant protection products, depends much on personal decisions. Furthermore, these decisions can be influenced by various factors: risk perception, awareness of belonging to a risk group, awareness of the seriousness of potential hazards, belief that prevention is effective in reducing potential risk and also that prevention is possible (Damalas et al., 2006). Moreover, increasing knowledge of pesticide safety, adequate training, and perception of the effectiveness of PPE can be beneficial in encouraging PPE usage (MacFarlane et al., 2008).

Among individual factors there are others, such as personality (Jones and Wuebker, 1985), perceived benefits (Kerr et al., 2002), barriers and self-efficacy (Feola and Binder, 2010).

The second category considers interpersonal factors. Among the factors, safety climate has an important role, it represents how much supervisors value safety over production (Toderi et al., 2015). Arcury and colleagues (2015), in a study of latino residential roofers, found that the safety climate was significantly associated with each type of employer-provided PPE, for instance the percent of time participants used goggles, gloves, and hard hats, however, the work safety climate was not associated with beliefs on the importance of any PPE.

However, different factors can explain the use of PPE using other modals, for example, the Health Promotion Model (HPM), presented by Pender (1996) that combines organizational and personal factors in assessing the use of PPE provided. HPM focuses on three areas: individual characteristics and experiences, behavior-specific cognitions and affect, and behavioral outcomes. The theory notes that each person has unique personal characteristics and experiences that affect subsequent actions. The set of variables for behavior specific knowledge and affect have important motivational significance. Health promoting behavior is the desired behavioral outcome, which makes it the final goal in the Health Promotion Model. These behaviors should result in improved health, enhanced functional ability and better quality of life at all stages of development. The final behavioral demand is also influenced by immediate competing demand and preferences, which can derail intended actions for promoting health. In the HPM, modifying factors such as demographic characteristics and interpersonal influences are proposed as indirect influences on health related behavior, exerting their influence through the cognitive-perceptual factors that directly affect behavior.

A different perspective is adopted by the KAP (Knowledge, Attitude and Practices) model which focuses on personal factors. Prior studies have stated that both individual and organizational factors are related to PPE measures (Ronis et al., 2006). Additionally, most studies have documented significant relationships between variables within the HPM framework and protective behaviors such as the use of PPE (Ronis et al., 2006).

1.1 Emotion and accidents

Despite the psychological factors being able to influence safety behaviors, such as the use of PPE, they have been widely studied, research on PPE use focused mainly on rationale aspects able to influence behaviors without considering emotional drivers.

In general, the emotional experience is defined as a complex system of physical and psychological changes, including physiological activations, feelings, cognitive and behavioral reactions, processes put in place by the individual in response to a situation perceived to be personally significant, highlighting, therefore, a close connection between emotion and action. They occur not only as a direct result of the success or failure of their behavior, but they are, in turn, cause of actions and modifications of its conduct. Therefore, emotions are necessary to achieve the individual aims, pushing the person towards one direction rather than in another.

Moreover, numerous studies in literature have shown that positive and negative emotions are not the poles of the same continuum, but are two independent orthogonal factors that can coexist and are considered in a manner disconnected from each other (Kaplan et al., 2009). From these considerations, this research distinguishes between: Positive affect (positive feelings, acronym PA) and negative affect (negative feelings, acronym NA), and their effects on behaviors adopted by the workers will be analyzed in a disconnected manner. The study of Kaplan and colleagues (2009) have shown the presence of a strong link between negative emotions and counterproductive behaviors. These may impact not only on job performance inherent in the task, but also the same working environment, making it difficult and stressful.

Conversely, when an individual is placed on high levels of PA, he experiences feelings of pleasure, excitement and joy; but if you stand on low levels of PA, the individual experiences feelings of laziness and apathy. In addition, high levels of NA are associated with feelings such as guilt, fear, nervousness and anxiety. Low levels of NA are connected with calm and quiet (Kaplan et al., 2009). There was evidence that high levels of NA are associated with adverse effects on the worker's performance, more negative outcomes, dropout behavior and an increasing number of accidents. In addition, a link has been demonstrated between NA and a

lower sense of control experienced by individuals, reduced coping skills and who are less likely to take preventive behaviors in relation to risks, such as the use of PPE (Kaplan, 2009). Iverson and Erwin (1997) have shown the predictive role of PA and NA working on accidents; they showed a positive relationship between NA and most distractibility and attentional lapses on the part of workers, thereby increasing the probability of incurring accidents. High levels of PA facilitate the onset of an active control feeling of their work environment and correlate with a reduced number of accidents at work (Iverson and Erwin, 1997). As discussed here, some studies in literature have investigated the role played by emotions in the workplace, in particular by analyzing their effect on work performance and on the probability of occurrence of accidents. They have not, however, examined experiences experienced by individuals in the use of PPE prescriptive. In this sense, the present study takes on an innovative form and references to the positive and negative emotions felt by workers in specific relation to the use of two pieces of personal protective equipment: the seat belt for forklifts and gloves used in the industry of storage, which will be further dealt with later.

2. Aim, method and results

The main aim of this study is to analyze the role played by emotions in using PPE during their task performance in order to develop training course which could effectively improve the use of PPE and consequently reduce negative outcomes such as injuries and accidents.

2.1 Participants

A warehouse of a large company based in Italy was the context of our research. The warehouse was structured in two basic functions, inbound (in coming materials) and out bounding (out-going materials). Hiendrich's pyramid for three years (2011-2013) showed the following data: 66 first aids, 6 lost time accidents and zero sever and fatal injuries. Safety is conceived in function of a prescribed set of behaviors: workers are explicitly advised on norms and sanctions. The sample consisted of 133 workers (74% of the warehouse population); 53% of them worked from zero to fifteen years in the organization and 14% had a role in safety practices (e.g. emergency team).

2.2 Measures

A structured anonymous questionnaire was used to collect the data. The questionnaire was administered in pencil-and-paper format. The study assured respondents anonymity and confidentiality. The participants completed the questionnaires privately and voluntarily in the workplace. Age or gender was not asked to guarantee the unidentification of participants.

The measure of the positive and negative emotions in the use of PPE were based on 8 questions of the International Scale Positive and Negative Affect Schedule Short-Form (I-PANAS-SF) by Thompson (2007). The items were chosen on the basis of focus groups conducted in order to adapt the instrument to the specific target of the investigation and an example of item is "When using the belt to the carriage (or safety gloves), what do you feel?". A graduated scale of up to 10 points was adopted, the extremes ranging from "for nothing" to "completely" for each item listed. The scale was used in reference to the workers experiences on the use of two safety devices required in stock: gloves and a safety belt on fork lift. The scale validation in different cultural contexts makes it an extremely versatile tool. In addition, it is more convenient for research when several variables are inserted with a target audience having limited time available for its completion.

In order to measure the motivation of safety (Mariani et al., 2015) in the workplace we have used four items from the model developed by Griffin and Neal (2000) aimed at identifying the impact of organizational climate on safety climate. Some examples of items are "I feel that it is important to reduce the risk of injuries and accidents in the workplace"; "I feel that it is important to maintain safety at all times". The validity of the instrument in the Italian context was conducted by Toderi and colleagues (2015) and the mode of response provides for a scale in a five point Likert format that varies from "not at all" to "completely".

In order to measure behaviors adopted by the workers regarding compliance with the rules and safe procedures, including the use of personal protective equipment, four items based on the same model (Griffin and Neal, 2000), validated in the Italian context by Toderi and colleagues (2015) were used. The answer mode provides a Likert five-point scale ranging from "not at all" to "completely" and some examples of items are "I perform my job safely"; "I adopt all the necessary personal protective equipment to carry on my work".

2.3 Results

Figure 1 shows the positive emotions concerning the use of safety belts and gloves on a scale ranging from 1 to 10. Considering the positive emotions, workers generally reported higher levels in respect to the use of gloves compared to safety belts. Specifically, participants reported higher levels concerning the emotions "safe" and "protected", while lowest levels were found on "one pleasant state" and "relieved".

Figure 2, in line with previous results, shows that, generally, workers reported higher levels of negative emotions considering the use of safety belts. Contrary to the levels of positive emotions, the negative ones present lower differences among the different categories of emotions.

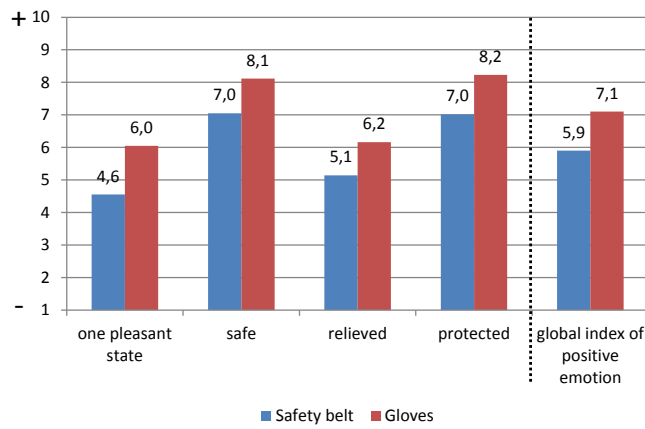


Figure 1: Means concerning different types of positive emotions in the use of gloves and safety belts answering the question “How do you feel when you use safety gloves/safety belt?”



Figure 2: Means concerning different types of negative emotions in the use of gloves and safety belts answering the question “How do you feel when you use safety gloves/safety belt?”

Moreover, we compared the two different PPE on the basis of the global indexes of positive emotion and negative emotion. Results showed that gloves got higher positive emotion (t-test=3.349; sig.=.001) and lower negative emotion (t-test=2.202; sig.=.029) then belts. Furthermore, we conducted Pearson correlation analyses in order to test the relationship between the variables under study.

Table 1: Correlation matrix

Variables	M	SD	1	2	3	4	5	6
1.Positive emotions belts	5.90	2.47	(.86)					
2.Negative emotions belts	3.74	2.84	-.54**	(.93)				
3.Positive emotions gloves	7.14	2.30	.35**	.02	(.85)			
4.Negative emotions gloves	2.89	2.11	-.017	.48**	-.08	(.79)		
5.Safety motivation	4.28	0.69	.30*	-.13	.27**	-.20*	(.89)	
6.Safety compliance	4.05	0.75	.26*	-.09	.31**	-.04	.61**	(.87)

Notes: * p <.05; ** p <.01; Cronbach’s alpha values in brackets.

The results (table 1) showed that the influence of positive emotions in the use of belts and gloves was positively related to safety motivation and safety compliance. Concerning the negative emotions, they were

not related to safety compliance and only negative emotions on gloves were negatively related to safety motivation while there was not the same association with negative emotions on belts. Furthermore, results highlighted the influence of positive emotions in the use of gloves and of motivation to safety on safety compliance.

3. Discussion

The purpose of this study was to augment knowledge concerning which factors could influence safety compliance behaviors such as the use of PPE. Despite investigated psychological factors in previous literature, less attention has been paid to the role of emotions in safety behaviors. Aiming to fill this gap in the literature our study shows that PPEs can evoke different levels of both positive and negative emotion. Gloves evoked higher levels of positive emotion and lower levels of negative emotion than belts. This evidence is in line with data of the company that reports a higher number of violations for the miss use of belts than the miss use of gloves.

Moreover, the research highlighted the role played by emotions on the PPE use and safety motivation and compliance. Specifically, we found that positive emotions are more related to safety motivation and safety compliance compared to the negative emotions. This suggests that increasing positive emotions concerning PPE should increase the effective use of PPE and consequently, reduce averse safety outcomes.

It is interesting to note that negative emotions do not seem to be related to safety compliance, meaning that having negative emotions does not seem to be hazardous concerning the decision to use the PPE. This result is encouraging, although more studies are needed to be developed in order to deeply understand potential negative effects of negative emotions.

Furthermore, our results showed the role played by emotions and motivation to safety in the use of PPE, especially the use of gloves which is especially relevant in the growing food sector. Our results are in line with previous studies which showed that motivation, especially intrinsic, is able to affect the perception on the safety rules (Ricci et al 2016). Results of this study are useful in order to understand which factors are able to modify the compliance with safety behaviors, which in turn could affect near miss injuries and accidents. In light of these results, emotions concerning the use of PPE should be considered in safety training.

According to the Italian Agreement between State and Regions, which states that teaching methodology of safety training should privilege an interactive approach that involves the centrality of the worker, these results underlined the importance of considering positive and negative emotions in developing effective safety training courses. Experiential learning approach is preferable in order to encourage reflection on the experience to develop new skills, new attitudes, or new ways of thinking. While experiential learning is experience-based, not all experience-based learning is experiential learning (Beard and Wilson, 2013): it is the reflection process which turns experience into experiential education. According to Experiential Learning Cycle Model (Kolb et al., 2001), emotions, together with cognition and environmental factors are aspects of experience that influence the learning process. Classroom-based experiential learning can take a multitude of forms, including role-play, games, case studies, simulations, and various types of group work. Using these activities during a safety training course, it is possible to enhance the self-awareness of own emotions toward safety behaviours and modify them.

In addition, the above-mentioned Agreement provides the topics of safety training divided into basic training, safety supervisor training and manager training. Relying on our study results, emotions should be included in all of the three categories, in order to empower workers in the knowledge of the potential effects of emotions. The importance of focusing on three levels (workers, supervisors and managers) has been suggested as crucial in the academic field too (Vignoli et al., 2014). In fact, more line workers, safety supervisors and managers should be aware of the role of emotions in the use of PPE for many reasons. First of all, managers and supervisors could play an important role in the management of workers decision making on tasks, shifts, and behaviors to use. Secondly, managers and supervisors can play an important role in modifying the development of the safety climate of the organization, which is another factor able to influence the use of PPE and consequently the occurrence of injuries and accidents. Lastly both supervisors and managers could have an indirect effect on the use of PPE, thus, being aware of the role that emotions can play in safety behaviours of the workers they can provide policies and encourage behaviors, through their leadership style, that take in consideration these aspects.

Reference

- Arcury T.A., Summers P., Rushing J., Grzywacz J.G., Mora D.C., Quandt S.A., et al. 2015, Work safety climate, personal protection use, and injuries among Latino residential roofers, *Am. J. Ind. Med.*, 58, 69-76. DOI: 10.1002/ajim.22404

- Baumeister R.F., Vohs K.D., DeWall C.N., Zhang L., 2007, How emotion shapes behavior: Feedback, anticipation, and reflection, rather than direct causation, *Pers. Soc. Psychol. Rev.*, 11, 167-203. DOI: 10.1177/1088868307301033
- Beard C., Wilson, J., 2013, *Experiential learning: A handbook for education, training and coaching*. Kogan, Philadelphia, PA.
- Damalas C.A., Georgiou E.B., Theodorou M.G., 2006, Pesticide use and safety practices among Greek tobacco farmers, A survey, *Int J Environ Health Res.*, 16(5), 339-348.
- Feola G., Binder C.R., 2010, Why don't pesticide applicators protect themselves? Exploring the use of personal protective equipment among Colombian smallholders, *Int. J. Occup. Environ. Health*, 16(1), 11–23. DOI: 10.1179/107735210800546218
- Guglielmi D, Avanzi L, Chiesa R, Mariani MG, Bruni I, Depolo M, (2016), Positive aging in demanding workplaces: The gain cycle between job satisfaction and work engagement. *Front Psychol*, 7. doi:10.3389/fpsyg.2016.01224.
- Griffin M., Neal A, 2000, Perceptions of safety at work: a framework for linking safety climate to safety performance, knowledge and motivation, *J Occup Health Psychol.*, 5: 347-358
- Hogarth R.M., Portell M., Cuxart A., Kolev G.I., 2011, Emotion and reason in everyday risk perception, *J Behav Decis Mak*, 24(2):202-222.
- Iverson, R., & Erwin, P. J., 1997, Predicting occupational injury: The role of affectivity, *Journal of Occupational and Organizational Psychology*, 70(2), 113-128.
- Jones J.W., Wuebker L., 1985, Development and validation of the safety locus of control scale, *Percept. Mot. Skills*, 61(1), 151–161. DOI: 10.2466/pms.1985.61.1.151
- Kaplan, S., Bradley, J., Luchman, J., Haynes, D., 2009, On the Role of Positive and Negative Affectivity in Job Performance: A Meta-Analytic Investigation, *Journal of Applied Psychology*, 94(1), 162-176.
- Kerr M.J., Lusk S.L. Ronis D.L., 2002, Explaining Mexican American workers' hearing protection use with the health promotion model, *Nurs. Res.*, 51 (2), 100– 109.
- Kolb, D.A., Boyatzis, R.E., Mainemelis, C., 2001, *Experiential learning theory: Previous research and new directions*, in Sternberg, RJ, Zhang, L, Sternberg, RJ, & Zhang, L (eds.), *Perspectives on thinking, learning, and cognitive styles*, Lawrence Erlbaum Associates Publishers, Mahwah, NJ, US, pp. 227-247
- Lu L., Shi L., Han L., Ling L., 2015, Individual and organizational factors associated with the use of personal protective equipment by Chinese migrant workers exposed to organic solvents, *Saf Sci*, 76:168-174.
- MacFarlane E., Chapman A., Benke G., Meaklim J., Sim M., McNeil J., 2008, Training and other predictors of personal protective equipment use in Australian grain farmers using pesticides, *Occup. Environ. Med.* 65(2), 141–6. DOI: 10.1136/oem.2007.034843
- Mariani M.G., Soldà B.L., Curcuruto M., 2015, Employee safety motivation: Perspectives and measures on the basis of the self-determination theory, *Med Lav*, 106, 333-341.
- Pender, N.J., Murdaugh, C., Parsons, M.A., 2011, *Health Promotion in Nursing Practice (6th ed.)*. Pearson, Boston, MA.
- Ricci A., Guglielmi D., Mariani M.G., Vignoli M, Violante F.S., 2016, The improvement of Safety Rules by a Participatory Method. A case study in a Chemical Company, *Chemical Engineering Transactions*, 53, 175-180, DOI: 10.3303/CET165303
- Ronis, D.L., Hong, O., Lusk, S.L., 2006, Comparison of the original and revised structures of the health promotion model in predicting construction workers' use of hearing protection, *Res. Nurs. Health* 29 (1), 3–17. DOI: 10.1002/nur.20111
- Serpe, A. & Cavazza, N., 2007, I predittori psicosociali degli infortuni sul lavoro, *Psicologia sociale*, 2, 247-274.
- Slovic P., 1999, Trust, emotion, sex, politics, and science: Surveying the risk- assessment battlefield, *Risk Anal.*, 19(4), 689-701.
- Thompson, E., 2007, Development and Validation of an Internationally Reliable Short-Form of the Positive and Negative Affect Schedule (PANAS), *Journal of Cross-Cultural Psychology*, 38, 227-242.
- Toderi S., Gaggia A., Mariani M.G., Mancini G., Broccoli M., 2015, Griffin and Neal's safety model: Determinants and components of individual safety performance in the Italian context, *Med Lav*, 106(6), 447-459.
- Vignoli M., Punnett L., Depolo M., 2014, How to measure safety training effectiveness? Towards a more reliable model to overcome evaluation issues in safety training., *Chemical Engineering Transactions*, 36, 67-72, DOI:10.3303/CET1436012
- Wallace, J., Vodanovich, S., 2003, Workplace safety performance: Conscientiousness, cognitive failure, and their interaction, *Journal of Occupational Health Psychology*, 8, 316-327.