

Safety Climate and its Relationship with Furniture Companies' Safety Performance

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ABSTRACT

Safety climate has been stated as a relevant measure to monitor safety performance. However, it is important to demonstrate that the measures used by companies are appropriate for this purpose. In this context, the current study aims to analyze the relationship between safety climate level and the companies' safety performance in the Portuguese furniture sector. A total of 14 Portuguese furniture companies were studied. The assessment of the safety climate, considering a multilevel structure, was performed by the use of the Safety Climate in Wood Industries (SCWI) tool. The companies' safety performance was analyzed through the application of a checklist. The analysis of the results showed a strong linear positive relation between safety climate scores and the percentage of safety performance. A further analysis was carried out to investigate the relationships between each analyzed scale with the work group' safety performance. The organizational scale was identified as the most correlated with that variable. In general, the study showed that safety climate, particularly the SCWI tool, is a good measure to analyze and to monitor the furniture companies' safety performance, identifying the most problematic work groups and showing that as higher the safety climate scores, higher safety behaviors and workplace with better safety conditions are expected.

Keywords: Furniture companies, Safety climate, Safety performance

INTRODUCTION

The Portuguese furniture industry is an important sector in an economical point of view, particularly in the north part of the country. However, this sector still presents several problems related to safety, which are reflected in the current number of accidents, approximately 7% of the total accidents in the Portuguese manufacturing industry (Eurostat, 2012). Nowadays, the furniture industry is a sector that has been increasing its competitiveness involving Safety Management (2019)

its modernization and an increasing safety concern. Therefore, these companies need to analyze their safety status, identifying the key problems and improving their safety performance.

Safety climate measures can be a good approach to monitor the companies' safety performance, warning of problems related to safety, preferably before injuries occur, and allowing for the design of safety interventions and management programs (Arezes & Miguel, 2005; Vinodkumar & Bhasi, 2009). It refers to the shared perceptions and/or attitudes about safety at a given point in time, particularly about safety policies, procedures and practices (Flin *et al.*, 2000; Tharaldsen *et al.*, 2008, Zohar, 2008). It has been referred to as a relevant tool to monitor the companies' safety performance. In fact, several studies found a relationship between safety climate and safety-related outcomes as risk perception, safety management systems and, directly or indirectly, between safety climate and accident rates and safety behaviors (Varonen & Mattila, 2000; Rundmo, 2000; Johnson, 2007; Huang *et al.*, 2007; Arocena *et al.*, 2008; Nielsen *et al.*, 2008; Tharaldsen *et al.*, 2008; Vinodkumar & Bhasi, 2009; Lu & Yang, 2011; Fugas *et al.*, 2012). However, it is important to use a correct instrument in order to achieve the pretended results.

Safety Climate in Wood Industries (SCWI) is an instrument for measuring safety climate using a multilevel structure developed by Rodrigues *et al* (in press), specifically for the furniture sector. This instrument moves away from the previous measures of safety climate that traditionally considered a single level of analysis and comes close to the re-defined version of safety climate as a multilevel construct (Zohar and Luria, 2005; Zohar, 2008). SCWI includes three levels of analysis, i.e., organizational, group and individual level. This instrument is seen as an upgrade to the Multilevel Safety Climate Scale of Zohar & Luria (2005), including a new level of analysis, the individual level. This level is related to the workers' practices. They are responsible for complying with company policies and procedures; however, due to rational and perceptual processes individual differences (Guldenmund, 2007), as well as, due to context and the coworkers' influences (Brondino *et al.*, 2012; Glendon *et al.*, 2006), different attitudes and perceptions can be found and can be measure at an individual level. From this perspective, the safety climate is influenced not only by the actions of management and supervisors but also by coworkers and situational influences, as well as, by individual perspectives. Furthermore, SCWI includes items specific for the furniture sector allowing enhance the instrument sensitivity (Zohar, 2008).

Given the foregoing, this study is an extension of the Rodrigues *et al* (in press) work, where an analysis of the relationship between safety climate level and the companies' safety performance in the Portuguese furniture sector is performed.

METHODOLOGY

Sample

A total of 14 Portuguese furniture companies were studied. The analyzed companies varied in size from micro- to medium- sized companies and are all located in northern of Portugal (region with the highest concentration of this industrial sector). A total of 33 work groups were identified and 403 workers who perform manual labor considered for the study. The group definition took into consideration the department/sector of activity, supervisors and physical boundaries. Most of the participants were males (86.6%), and their mean age was 39.49 years old (SD = 10.09; interval range 18-63 years old). Workers had been employed by their companies for an average of 10.47 years (SD = 7.27; interval range 0-37 years) and had been engaged in manual labor for an average of 17.49 years (SD = 12.06; interval range 1-50 years).

Safety Climate Analysis – SCWI tool

The analysis of the safety climate was performed by the use of the Safety Climate in Wood Industries (SCWI) tool. This tool was previously developed and validated by the authors in Rodrigues *et al.*, (in press). This is a specific instrument to measure the safety climate in the furniture sector that contemplates the hierarchical structure of the

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organizations, including the three levels of analysis (organizational, group and individual).

The SCWI includes two main parts. The first part comprised workers' demographic questions, such as age, gender, department/sector, professional activity, number of years working at the company, number of years at the applicable professional activity and previous involvement in work accidents. The second part included 34 items for measuring safety climate, analyzing three different levels: organizational, group and individual levels. Organizational level was measured with 13 items concerning management investment in safety issues, continuous improvement of safety systems and safety communication. Group level was measured with 12 items. At this level, workers were asked about supervisor concerns regarding workers' safety practices, involvement in safety issues and effort in regards to rules compliance and safety protection use. Finally, at the individual level, 9 items measured workers' commitment to safety. The description of the items included for each level of analysis can be found on the Table 1. The level of agreement with each item was assessed using a 5-point Likert scale that ranged from "1=Strongly disagree" to "5=Strongly agree".

Table 1. SCWI tool: items for measuring safety climate.

Organizational Level	Item
The management of this company....	<ul style="list-style-type: none"> reacts quickly when a dangerous situation is detected, or there is an accident or incident occurs. insists on thorough and regular safety audits and inspections. is not interested in continually improving safety levels in each department. does not invest in modernizing work machines. invests in the implementation of measures to minimize the manual handling of loads. provides all the equipment needed to do the job safely. is strict about working safely when we are working under pressure. requires each supervisor/team leader to help improve safety in his or her sector or department. invests much time and money in safety training for workers. uses all available information to improve existing safety rules. promotes the development of appropriate work procedures for the tasks performed by workers. does not consider to workers' suggestions about improving safety. provides workers with sufficient information on safety issues.
Group Level	Item
My supervisor or team leader...	<ul style="list-style-type: none"> makes sure we receive all the equipment needed to do the job safely. does not check frequently to see whether we are all obeying the safety rules. discusses how to improve safety with us. rather than using explanations, compels us to act safely. worries that I fulfil with the regulations and work procedures. worries that I use all of the machines protections lets safety rules and procedures be ignored when we are working under pressure. frequently tells us about the hazards of our work. makes that sure we follow all the safety rules, not just the most important ones. is strict about safety at the end of the shift, when we want to go home. spends time helping us learn to see problems before they arise. insists that we wear our personal protective equipment even if it is uncomfortable.
Individual Level	Item
I....	<ul style="list-style-type: none"> believe that safety is the main priority when I do my work. report dangerous situations immediately to one of my superiors whenever I see them. try to always follow the rules and work procedures when I run my work. do not use the personal protective equipment necessary for performing tasks. do not always use the machine's protections. refuse to ignore safety rules, even when the work is delayed and production must be increased. disregard safety rules at the end of the shift, when we want to go home. clarify all my questions about the risks to which I am exposed. do not bring it to my colleagues' attention when I see them violating some rule or safety procedure.

Safety Performance Analysis

A safety audit was performed to the analysis of the safety performance. It was supported on a checklist developed for this study, based on the Portuguese legislation (e.g., Decreto-Lei n° 103/2008; Decreto-Lei n° 24/2012; Decreto-Lei n° 347/93; Portaria n° 987/93) and specific guidelines for the furniture sector (e.g. Miguel *et al.*, 2005). The checklist included a set of 112 items related to the safety conditions of workplaces, equipment and machinery, as well as related to tasks (safety behaviors and procedures). These items were evaluated based on a 5-point Likert

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scale adapted from Reese (2012), in which 1=very deficient and 5=excellent, to characterize the level of deficiency of each feature/behavior under analysis. In all cases, “not applicable” was a possible response when a risk factor was not verified as applying to the specific situation under analysis. At the conclusion of the safety conditions analysis, all results were discussed with the companies’ management and supervisors.

RESULTS

Firstly, the average of safety climate scores for each work group and level of analysis was computed and the results are presented in Table 2. The safety climate scores were computed at group level, because it was the intent of this work to analyze its relationship with the group safety performance. The results show differences in safety climate between work groups, even in groups belonging to the same company. These differences are statistically significant for the organizational level ($KW(31)=235.894$, $p<0.001$), group level ($KW(31)=168.287$, $p<0.001$), individual level ($KW(31)=151.041$, $p<0.001$) and for the total safety climate score ($KW(31)=208.429$, $p<0.001$).

Group 13, related to company E, presents the highest safety climate level and group 21, related to company I, presents the lowest. Such groups are referent to companies that only present one work group. The work groups, as previously mentioned, were defined considering the department/sector of activity, supervisors, and physical boundaries. However, as some of the analyzed companies presented less than 12 workers, all workers were exposed to the same risks and no fixed workplaces were observed, it was only defined one work group. The results of the Table 2 also showed that in general, groups allied to the cutting department presented the lowest safety climate level (7, 11, 15, 18, 22, 27 and 28) and groups allied to the storage and assembly departments the highest safety climate level (8, 10, 12, 16, 10, 23, 24, 29 and 31).

Table 2. Safety climate average scores (\pm sd) by group and level of analysis.

Company	Group	Organizational scale*	Group scale*	Individual scale*	Total average score*
A	1	35.0 \pm 2.5	28.4 \pm 3.0	28.4 \pm 1.0	91.8 \pm 4.96
B	2	37.1 \pm 6.9	35.4 \pm 4.9	34.4 \pm 4.1	106.9 \pm 8.0
	3	32.9 \pm 3.3	35.7 \pm 4.9	31.6 \pm 2.2	100.1 \pm 7.8
	4	46.2 \pm 4.7	41.8 \pm 3.8	33.8 \pm 3.3	121.8 \pm 8.5
	5	41.33 \pm 1.4	40.33 \pm 2.1	31 \pm 1.63	112.7 \pm 2.8
	6	49.0 \pm 2.5	46.7 \pm 5.5	30.0 \pm 7.5	128.7 \pm 4.8
C	7	37.8 \pm 6.6	45.6 \pm 3.2	36.2 \pm 4.4	119.6 \pm 8.1
	8	46.4 \pm 7.1	41.5 \pm 4.3	33.2 \pm 3.0	121.1 \pm 8.2
	9	44.4 \pm 3.8	41.6 \pm 3.0	33.4 \pm 4.3	119.4 \pm 6.5
	10	43.7 \pm 3.8	40.1 \pm 3.0	40.5 \pm 4.1	124.2 \pm 4.8
D	11	45.6 \pm 4.8	49.6 \pm 4.1	32.8 \pm 4.4	119.8 \pm 8.0
	12	47.4 \pm 5.2	43.3 \pm 2.7	41.4 \pm 3.2	122.1 \pm 9.6
E	13	50.8 \pm 1.6	41.0 \pm 2.2	34.8 \pm 1.0	141.4 \pm 2.9
F	14	44.0 \pm 3.1	38.1 \pm 2.5	31.3 \pm 3.0	128.2 \pm 8.8
G	15	35.5 \pm 1.9	31.2 \pm 3.6	26.2 \pm 2.9	93.0 \pm 6.5
	16	33.5 \pm 1.5	40.8 \pm 5.0	30.5 \pm 2.2	104.7 \pm 7.7
H	17	55.4 \pm 4.0	42.5 \pm 2.7	36.1 \pm 2.9	136.3 \pm 7.7
	18	53.9 \pm 2.1	45.8 \pm 2.0	33.9 \pm 3.4	110.4 \pm 5.0
	19	54.0 \pm 4.8	45.3 \pm 3.6	36.3 \pm 3.9	135.7 \pm 8.0
	20	56.1 \pm 4.6	48.7 \pm 4.5	37.4 \pm 5.1	142.3 \pm 9.2
I	21	24.7 \pm 1.6	27.6 \pm 2.5	18.3 \pm 1.1	70.7 \pm 1.9
J	22	42.5 \pm 3.6	35.3 \pm 3.8	31.6 \pm 2.9	114.6 \pm 6.2
	23	48.6 \pm 2.7	39.4 \pm 3.3	35.0 \pm 1.5	124.4 \pm 3.0
	24	46.0 \pm 1.4	44.0 \pm 1.4	35.3 \pm 0.9	125.3 \pm 0.9
	25	48.8 \pm 1.8	47.2 \pm 2.2	36.4 \pm 2.6	132.4 \pm 4.5
K	26	51.1 \pm 4.5	42.9 \pm 4.6	35.1 \pm 2.0	128.1 \pm 7.1
	27	42.8 \pm 3.8	38.5 \pm 1.5	30.2 \pm 1.1	111.5 \pm 5.0
M	28	49.8 \pm 3.8	42.6 \pm 1.7	32.1 \pm 3.2	124.7 \pm 6.1

	29	56.0±3.1	43.8±3.8	37.9±1.8	137.7±6.4
	30	51.0±3.6	44.2±4.1	34.4±2.8	129.6±7.7
	31	51.8±3.5	45.6±4.7	36.4±3.1	133.8±8.4
N	32	39.8±1.8	38.7±1.7	26.9±1.74	105.6±5.3
L	33	50.0±1.8	39.0±1.8	29.0±1.0	117.0±1.0

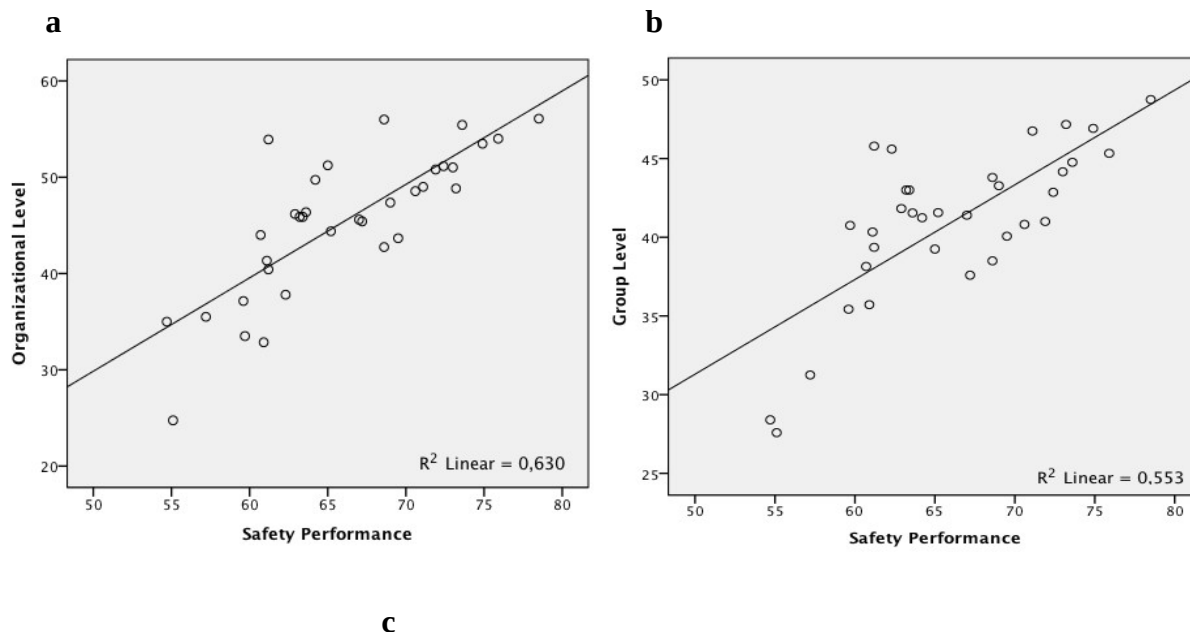
*Average ± Standard Deviation

The analysis of the relationship between safety climate level and the companies' safety performance was performed at the group level using the aggregated mean scores of the safety climate for each group in analysis. A strong linear positive relation was found (Table 3), meaning as higher the safety climate scores, higher safety behaviors and workplace with better safety conditions are expected. The organizational level was the most correlated with the work group safety performance.

Table 3. Linear relation between safety performance and safety climate, by level of analysis.

	r	r ²	Adj. r ²	df	F	Sig.
Organizational level	0.794	0.630	0.618	1	54.438	0.000
Group level	0.743	0.553	0.539	1	39.549	0.000
Individual level	0.686	0.471	0.454	1	28.474	0.000
Total safety climate	0.820	0.673	0.663	1	75.820	0.000

Figures 1 to 3 represent the linear relation between safety performance and safety climate for each level in analysis, i.e., organizational, group and individual levels. The results show that for organizational and individual level one work group is away from the linear regression due to the lower levels of safety climate. However, for the group level three work groups are highlighted due to the low safety climate scores.



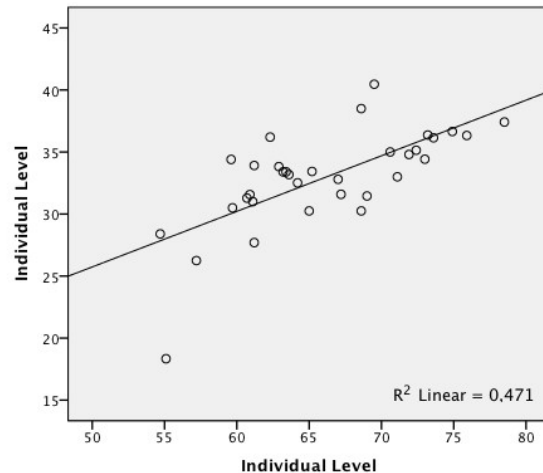


Figure 1: Linear relation between safety performance and safety climate: (a) Organizational Level, (b) Group Level and (c) Individual Level.

DISCUSSION

The results of this study show significant differences in safety climate among work groups and these differences are related with companies' safety performance. These results are in accordance with previous studies, particularly the studies of Varonen & Mattila (2000) in wood-processing companies and with Cooper & Phillips (2004) that suggested that differences on safety climate level among work groups can be related to workplace safety conditions.

The obtained results reflect the problem of the cutting sector in the furniture companies. This was the sector where the low levels of safety climate were identified. In fact, in the most of furniture companies this sector is the most critical for workers' safety due to the use of dangerous machines. According to Miguel *et al.* (2005) saws, drill and milling-cutting machines without any protection or with their protections compromised by workers were common risk factors in this sector and were observed in this study in the course of safety audit. In addition, situations involving high noise exposure, manual handling, as well as materials and cables stored on passageways were identified in most of the analyzed companies in this sector. Furthermore, this is a critical sector in relation to production objectives, because the other sectors are dependent of this sectors production results. Thus, cutting workers may be subjected to greater pressure and, as a consequence, they may ignore some safety rules and procedures.

It is also important to emphasize that the level of safety climate is not dependent of the companies' size. According a study of the Portuguese Management School of Porto (EGP, n.d.), most of the furniture companies in this country are small, with reduced professionalization in terms of their management, marketing and trade policies, and most of their workforce consist of unqualified and undifferentiated workers. Bearing this in mind, in this study, companies with different size were included, being taken a special attention to the inclusion of some small sized companies, as they are the more representative of this sector. The results of this study show that companies with less than 12 workers both can have a high safety climate level as a very low safety climate level.

The results also showed a stronger relationship between the organizational level and the safety performance. This is a reflex of the importance of the policies and procedures defined by the companies' management to increase workplace safety (Guldenmund, 2007) in the level of safety climate. Workers may connect poor working conditions to managers' intervention. These results also indicated that the way that workers see the management effort to the improvement of safety systems and safety communication is different among the work groups of the same company. According Zohar (2008) the organizational level scale results should be aggregated across the company. As was intent of this study the analysis of the relationship between safety climate and safety performance, this analysis was performed at a group level and it proved to be important, because they indicate that if the analysis is performed aggregating all the companies' results, a problematic group can be hidden.

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The group and individual scales also presents a significant relationship with safety conditions. The supervisor concerns regarding workers' safety practices, involvement in safety issues and effort in regards to rules compliance and safety protection use, as well as the workers' commitment to safety are all factors that improve the work group safety performance. However, it is important to highlight that in some work groups the intervention of supervisors in relation to safety can be seen in a negative way. To three work groups the relation between safety climate and safety performance at group level is far from the linear regression due to the low safety climate score achieved to this scale. This result may be due to lack of knowledge/sensibility about risks by supervisors, allied to the tendency to give less value to safety than to production (Reese, 2012).

CONCLUSION

In general, the study shows that safety climate is a good measure to analyze and monitor of the companies' safety performance, showing that as higher the safety climate scores, higher safety behaviors and workplace with better safety conditions are expected. The results also showed that SCWI is a good measure to be used in the furniture companies to the analysis of safety performance in the sense that its multilevel structure allow to identify differences on safety climate among work groups, identifying the most problematic.

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