

Safety Climate in Finnish- and Swedish-Speaking Companies

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The aim of this study was to compare assessments made by Finnish- and Swedish-speaking workers in Finland about the safety climate in their companies, because an earlier study showed that the accident frequency of Swedish-speaking workers was one third lower than that of Finnish-speaking workers. 148 Finnish-speaking and 138 Swedish-speaking workers from 14 small and medium-sized companies participated in this study. They filled out a Finnish safety climate questionnaire, the reliability of which was above the acceptable level. There were no differences between the language groups in the total variables of safety climate and safety action. Based on the differences in single items, we interpreted that Swedish-speaking workers stressed collective safety more, whereas Finnish-speaking workers put more emphasis on their personal responsibility for safety.

mother tongue language group safety climate small and medium-sized companies

1. INTRODUCTION

Of the 5.1 million Finnish people, 5.6% speak Swedish as their mother tongue [1]. The Swedish-speaking minority inhabits mostly the southern and western coasts of Finland. Surprisingly, the most Swedish-speaking municipality in the world is found in Finland: 97.6% of the inhabitants of Korsnäs speak Swedish as their mother tongue.

Finland was a part of Sweden for over 600 years. In 1809 Finland was connected to Russia, from which it separated as an independent state in 1917. As the original Swedish-speaking population came to Finland several hundreds of years ago, it can now be considered part of the original population. The demographic variables of the Swedish-speaking population now closely resemble those of the Finnish-speaking majority. We therefore have two language groups living in the same country, under the same laws, regulations, and economic conditions. Both groups have equal rights; they have

their own schools and both are entitled to use their mother language in contacts with the authorities.

According to three independently gathered data sets, the accident frequency of Swedish-speaking workers was about 30% lower than that of Finnish-speaking workers. This difference was not due to underreporting of accidents among the Swedish-speaking workers, nor to the selection of Finnish-speaking workers to more hazardous jobs [2]. The aim of this article was to examine differences between Finnish- and Swedish-speaking workers in their perception of the safety climate in their companies.

Safety Climate

There is no consensus about the definition of safety climate among researchers. That is why nine different definitions of safety climate with key words like group, employees' perceptions, assembly, and molar were found [3]. In this study safety climate

was defined as the employees' perceptions, attitudes, and beliefs about the attitudes of the company's management towards risks and safety. Safety culture is a more complex trait reflecting fundamental values, norms, and expectations in the company [4].

Zohar [5] started the scientific measurement of safety climate in Israel with a questionnaire including 40 items. In factor analysis there were eight factors, of which the two most important ones were perceived relevance of safety to work behavior, and the employees' perceptions about the management's attitudes towards safety. In his later study, two other factors were found: the supervisor's actions and his/her expectations towards the employees [6].

The original model of eight factors was not replicated with manufacturing workers from Wisconsin and Illinois, USA [7]. Instead, three factors were found: employee perception of how concerned the management was about their well-being, how active the management was in safety issues, and perception of physical risks. The next study with construction workers in Baltimore, MD, USA [8], however, did not confirm this three-factor model. Safety climate at construction sites was loaded to two factors: the management's commitment to safety, and the workers' involvement in safety, which were close to the two original factors [5].

In one multinational European company with factories in the United Kingdom, France, Germany, The Netherlands, and Belgium, the employees' safety attitudes loaded onto five factors: personal skepticism, individual responsibility, safety of the work environment, effectiveness of safety arrangements, and personal immunity [9]. In another multinational European company working in the United Kingdom and France it was possible to find five factors in safety climate: safety management, communication, individual responsibility, safety standards and goals, and personal involvement [10]. There are some identical characteristics (individual responsibility and personal involvement) in these factor patterns.

Safety climate among Australian industrial workers was measured with Williamson et al.'s

own questionnaire with 62 items [11]. Five factors were found: personal motivation for safety, positive safety practice, risk justification, fatalism, and optimism. A shortened version of the questionnaire was used with 17 items representing all five factors; the questionnaire correlated significantly with occupational accidents.

The next step in the study of safety climate was to examine the correlations between safety climate and occupational accidents. This approach is based on the assumption that fewer accidents occur in companies with a good safety climate than in companies with a poor climate. This assumption was confirmed with chemical workers in the United Kingdom [12], offshore workers in the United Kingdom [13, 14, 15], metal workers in Israel [6] and in Poland [16], hospital workers in Costa Rica [17], wood-processing workers in Finland [18], construction workers in California, USA [19], and in Hong Kong [20]. The safest enterprises operating at the Tenerife, Canary Islands, airport also had the best safety climates [21, 22].

No direct link was found between safety climate and accidents in the Spanish samples, but safety climate nevertheless affected accidents through safe behavior and actual risks [23] or through safe behavior and the general health of the employees [24]. A study with American restaurant workers showed that transformational leadership influenced safety climate, which in turn affected occupational injuries via safety-related events [25]. Along the same lines, organizational climate determined safety climate, which influenced safety compliance and safety participation through safety knowledge and motivation [26]. No association was found between safety climate and safety performance of Australian road construction workers [27].

There may be several different safety climates within the same company. In the same division of a multinational American corporation, there were significant differences in the safety attitudes of the employees in US, French, and Argentine plants [28]. On the other hand, there were more significant differences in the safety attitudes between shop floor workers and the management, than between the employees of two British nuclear

power plants [29]. Two parallel safety climates in the same company can give the employees contradictory messages about attitudes towards safety, thus increasing the possibility of hazardous incidents.

A literature review of safety climate studies concluded that the management, the safety system, and risk were the three main themes examined in at least 12 of the total of 18 studies [30]. The status of risk perception in safety climate was more thoroughly examined [31]; employee risk perception was identified as an independent factor in two out of nine safety climate studies.

Safety climate in Finland was measured with a Finnish questionnaire developed by Seppälä [32], and based on Zohar's original questionnaire. When the safety attitudes of employees in plywood factories, shipyards, and forestry and construction sites were measured with the safety climate questionnaire, the attitudes loaded on four factors: organizational responsibility, workers' concern about safety, workers' indifference in regard to safety, and the level of safety actions. Measurement of safety climate in road administration with the same questionnaire resulted in four factors: attitude towards safety in the organization, changes in work demands, appreciation of the work, and safety as part of productive work [33]. Safety climate evaluated by wood-processing workers was also loaded on four factors: organizational responsibility, workers' safety attitudes, supervision of safety, and the company's safety precautions [18]. These Finnish studies with the same questionnaire showed that although the number of factories was the same, the content of the factories varied. This result indicated that the safety climate measure and the factor analysis based on it are very context dependent.

The main problem in the measurement of safety climate is that almost all researchers have developed their own questionnaires. This obviously slowed down the safety climate research, as the contradictory results could be explained by differences in the questionnaires instead of differences in the actual climate. It is noteworthy that there are not many studies on cultural differences in safety climate.

The aim of this study was to compare assessments of Finnish- and Swedish-speaking workers of the safety climate of their companies. In addition, the factor structures of safety climate in Finnish- and Swedish-speaking companies were analyzed. Results about the accident frequency of Finnish- and Swedish-speaking companies are also presented.

2. METHODS

This study was conducted in small and medium-sized companies, because totally Swedish-speaking companies are found only among this type of organization (Table 1). Fourteen small and medium-sized manufacturing companies from southern and central Ostrobothnia in Finland participated in the study. Finnish was spoken in six enterprises, Swedish in six. Both Finnish and Swedish were used in two enterprises. Eight of the enterprises were metal factories, two were sawmills, two furniture factories, and two dairies.

The questionnaire was distributed to the entire personnel of the participating enterprises during a group situation, such as lunch or a coffee break. Each employee chose either a Finnish- or a Swedish-language questionnaire. A completed questionnaire was returned by 148 Finnish-speaking and 138 Swedish-speaking managers, supervisors, and workers. Eighty-four per cent of them were males, 16% females. Six per cent of the subjects were directors of the companies, 21% were supervisors and other white-collar employees, and 73% of the subjects were blue-collar employees.

The subjects assessed the safety climate of their enterprises with a Finnish questionnaire [32]. The employees' observations about the hazards in their work were sought with 19 questions (alpha coefficient for sum variable .89). The employees' evaluations about the safety climate of their enterprises were measured with 14 items, which constituted a sum variable with an alpha coefficient of .80. Three items concerning risk-taking were measured with a reversed scale. When based on factor analysis, a measurement of safety management with seven items was developed; its alpha coefficient was .86. Based on the

TABLE 1. Characteristics of Companies Participating in the Study

Industry	Number of Employees	Swedish-Speaking Workers (%)
Finnish-speaking companies		
Metal	63	6
Metal	35	0
Agricultural machines	31	0
Saw mill	31	0
Furniture	40	0
Dairy	60	0
Bilingual companies		
Metal	38	55
Metal	50	62
Swedish-speaking companies		
Metal	36	72
Metal	30	77
Agricultural machines	52	98
Saw mill	25	80
Furniture	27	82
Dairy	32	94

other factor, the safety behavior dimension was constituted with four items (alpha coefficient .70). The work habits were the focus of 30 questions, of which the total value had an alpha coefficient of .94. The level of safety actions in the enterprise was checked with 22 questions with an alpha coefficient value of .97.

The differences between Finnish- and Swedish-speaking workers in the structure of safety climate were analyzed with factor analysis, based on the 14 items measuring safety climate. It was done separately for Finnish- and Swedish-speaking populations. Factor analysis was calculated with the maximum likelihood method with varimax rotation.

The companies also reported the number of employees in their companies. Based on their own or the insurance companies' accountings, the companies reported the number of occupational accidents over 6 years (1990–1995). Accident

frequency was calculated by dividing the number of accident by the number of employees and multiplied by 1000.

3. RESULTS

In accident frequency there was no significant difference between Finnish- and Swedish-speaking companies ($z = 1.60$, *ns*), although the frequency was 21% higher in Finnish-speaking than in Swedish-speaking companies (Table 2). However, the bilingual companies had a significantly higher accident frequency than Finnish- ($z = 5.42$, $p < .001$) and Swedish-speaking ($z = 6.53$, $p < .001$) companies.

There was no significant difference in the total safety climate between Finnish- and Swedish-speaking workers (Table 3). However, Finnish-speaking workers assessed three items significantly higher than Swedish-speaking workers, who had

TABLE 2. Accident Frequency by the Language of Company

Language	Companies	Accidents	Work Years	Accident Frequency
Finnish	6	108	1293	83.53
Swedish	6	71	1075	66.05
Bilingual	2	78	444	175.68

TABLE 3. Finnish- and Swedish-Speaking Workers' Assessment of Safety Climate in Their Enterprises

Item	Finnish-Speaking Workers (<i>n</i> = 165–182)	Swedish-Speaking Workers (<i>n</i> = 113–143)	<i>t</i> -test
Sum variable of safety climate	49.89	49.86	<i>t</i> = 0.03, <i>ns</i>
The top management values safety	3.80	4.02	<i>t</i> = -1.75, <i>ns</i>
Foremen encourage safe work habits	3.60	3.75	<i>t</i> = -1.18, <i>ns</i>
I can influence the safety of my work	4.34	4.42	<i>t</i> = -0.80, <i>ns</i>
Risk taking is part of my job	2.45	2.29	<i>t</i> = 1.04, <i>ns</i>
Foremen take care of workplace safety	3.11	3.60	<i>t</i> = -3.60, <i>p</i> < .001
I emphasize safety in my work habits	4.11	3.74	<i>t</i> = 3.38, <i>p</i> < .001
Haste at work influences risk taking	3.95	3.99	<i>t</i> = -0.33, <i>ns</i>
Co-workers comment about risk taking	3.58	3.83	<i>t</i> = -1.85, <i>ns</i>
I am interested in work safety	4.47	4.23	<i>t</i> = 2.28, <i>p</i> < .05
Work safety is handled flexibly	3.30	3.38	<i>t</i> = -0.62, <i>ns</i>
Work must be done regardless of risks	3.27	3.23	<i>t</i> = 0.27, <i>ns</i>
Safety personnel have influence at work	3.30	2.81	<i>t</i> = 3.18, <i>p</i> < .01
Foremen intervene in dangerous work habits	3.47	3.33	<i>t</i> = 0.92, <i>ns</i>
My work group values safety	4.24	4.40	<i>t</i> = -1.62, <i>ns</i>

Notes. Scale: 1—completely disagree, 5—completely agree.

a higher value on one item. Workers speaking Finnish weighted the safety of their work habits more often, were more interested in safety at work, and believed that safety managers and safety representatives had more influence on the action taken at their workplace. Compared to Finnish-speaking workers, workers speaking Swedish thought that their supervisors took better care of safety at their workplace.

There were two statistically significant differences in 22 questions that measured the safety action of the enterprises (Table 4). Swedish-speaking workers thought more often than Finnish-speaking workers that their enterprises encouraged suggestions to improve safety and reacted positively to them. There was no significant difference between the language groups in the total variable of safety action.

TABLE 4. Finnish- and Swedish-Speaking Workers' Assessment of Safety Action and Work Habits

Item	Finnish-Speaking Workers (<i>n</i> = 137–176)	Swedish-Speaking Workers (<i>n</i> = 90–136)	<i>t</i> -test
Safety action			
Attitudes towards improvement suggestions	3.13	3.43	<i>t</i> = -2.32, <i>p</i> < .05
Encouragement to make initiatives	2.69	3.03	<i>t</i> = -2.65, <i>p</i> < .01
Sum variable of safety action	67.80	65.88	<i>t</i> = 0.59, <i>ns</i>
Work habits			
Guidance of new employees to safety	1.77	1.59	<i>t</i> = 2.28, <i>p</i> < .05
Accessibility of personal protectors	2.45	2.24	<i>t</i> = 3.01, <i>p</i> < .01
Use of safety switches	2.26	2.07	<i>t</i> = 2.22, <i>p</i> < .05
Location of fire extinguishers	2.33	2.48	<i>t</i> = -2.08, <i>p</i> < .05
Access to first aid	1.99	2.17	<i>t</i> = -2.35, <i>p</i> < .05
Sum variable of work habits	62.68	61.21	<i>t</i> = 0.65, <i>ns</i>

Of the 30 items measuring work habits, there were statistically significant differences between the language groups in 5 items (Table 4). Finnish-speaking workers assessed the accessibility of personal protectors and safety switches better than Swedish-speaking workers. In addition, Finnish-speaking workers thought that in their enterprises new employees received more information about workplace safety than in Swedish-speaking enterprises. On the other hand, Swedish-speaking workers reported that there were more fire extinguishers and first aid equipment in their enterprises than in Finnish-speaking ones. There was no statistically significant difference between the language groups in the total variable.

Finally, the subjects assessed accident risk in their jobs with 19 items (Table 5). Swedish-speaking workers evaluated 11 factors better than Finnish-speaking workers, who thought that 3 factors were better in Finnish-speaking companies. Swedish-speaking workers felt that order in their work environment, traffic arrangements, access,

work rooms, lighting, protection of machines, carrying and lifting equipment, the handling of chemicals, manual lifting, work methods and work-related information were better or in better condition than in Finnish-speaking companies. Finnish-speaking workers reported that in their companies automatic machines, professional skills, and the use of personal protectors were at a better level than in Swedish-speaking companies. There was no significant difference between the language groups in the total variable of accident risks.

The factor analysis of safety climate brought up two factors which explained 90.2% of the variance among Finnish-speaking workers, and 88.3% of the variance among Swedish-speaking workers. The factor structure of Finnish- and Swedish-speaking workers regarding their observations about safety climate were very similar, because in both language groups the most important items were the same, although their order changed (Table 6). The first factor was called "safety

TABLE 5. Means of Finnish- and Swedish-Speaking Workers Concerning Their Assessments About the Hazards in their Work

Hazard	Finnish-Speaking Workers (<i>n</i> = 104–180)	Swedish-Speaking Workers (<i>n</i> = 66–138)	<i>t</i> -test
Sum variable of hazards	44.21	44.15	<i>t</i> = 0.04, <i>ns</i>
Order in the work environment	2.08	2.33	<i>t</i> = -4.12, <i>p</i> < .001
Traffic arrangements	2.30	2.52	<i>t</i> = -2.97, <i>p</i> < .01
Corridors and passages	2.09	2.37	<i>t</i> = -3.93, <i>p</i> < .001
Work sites	2.18	2.45	<i>t</i> = -4.16, <i>p</i> < .001
Lighting at work sites	2.21	2.49	<i>t</i> = -3.84, <i>p</i> < .001
Levels of service	2.20	2.32	<i>t</i> = -1.68, <i>ns</i>
Manual tools and instruments	2.20	2.33	<i>t</i> = -1.95, <i>ns</i>
Safeguards of machines	2.25	2.41	<i>t</i> = -2.22, <i>p</i> < .05
Carrying and lifting equipment	2.32	2.61	<i>t</i> = -4.03, <i>p</i> < .001
Automatic machines	2.60	2.26	<i>t</i> = 3.84, <i>p</i> < .001
Handling of chemicals	2.14	2.48	<i>t</i> = -3.78, <i>p</i> < .001
Conveyors	2.38	2.32	<i>t</i> = 0.66, <i>ns</i>
Physical exertion	2.11	2.19	<i>t</i> = -1.11, <i>ns</i>
Manual lifting	2.11	2.30	<i>t</i> = -2.70, <i>p</i> < .01
Work methods, work habits	2.18	2.49	<i>t</i> = -4.82, <i>p</i> < .001
Professional skills	2.49	2.13	<i>t</i> = 5.30, <i>p</i> < .001
Knowledge related to work	2.16	2.39	<i>t</i> = -3.14, <i>p</i> < .01
Cooperation in work team	2.36	2.25	<i>t</i> = 1.48, <i>ns</i>
Use of personal protectors	2.33	1.92	<i>t</i> = 5.74, <i>p</i> < .001

Notes. Scale: 1—poorly organized, caused hazards, 3—well organized, no hazards.

Table 6. The Varimax Rotation of Factor Analysis Done for Safety Climate Perceptions of Finnish- and Swedish-Speaking Workers

Item	Finnish-Speaking Workers		Swedish-Speaking Workers	
	Factor I	Factor II	Factor I	Factor II
The top management of the company values safety	.72	.22	.79	.20
Foremen encourage safe work habits	.69	.28	.77	.22
I can influence the safety of my work	.49	.15	.50	.05
Risk taking is part of my job	-.02	-.04	-.18	.13
Foremen take care of workplace safety	.73	.17	.65	.20
I emphasize safety in my work habits	.10	.48	.05	.64
The haste at work influences risk taking	-.28	.10	-.28	.27
Co-workers comment each other about risk taking	.14	.59	.10	.62
I am interested in work safety	.06	.55	.05	.72
Work safety is handled flexibly	.62	.31	.65	.31
The work must be done although with risk taking	-.23	-.01	-.53	.12
The safety personnel have influence at the workplace	.49	.38	.36	.44
Foremen intervene in dangerous work habits	.66	.35	.66	.40
My work group values safety	.08	.83	.17	.58

management”, because the items with the heaviest loading were “foremen take care of workplace safety”, “the top management of the company considers work safety to be important”, “foremen encourage safe work habits”, “foremen intervene with work habits, making work dangerous”, and “work safety is handled flexibly”. The second factor was named “personal and group-level safety behavior”, because the items loaded on this factor concerned “my work group values safety”, “co-workers talk to each other about risk taking”, “I am interested in work safety”, and “I emphasize safety in my work habits”.

In addition, a solution with three factors was calculated, but for Swedish-speaking workers the calculation was interrupted because of too high communalities. The three-factor model suited the Finnish-speaking population even better than the two-factor model. In the three-factor model for Finnish-speaking workers, the second factor was divided into one concerning work group, and another one concerning risk taking. When based on factor analysis, the sum variables of safety management and safety behavior did not differentiate Finnish- from Swedish-speaking workers (safety management: $t = -0.61$, $df = 199$, ns ; safety behavior: $t = 0.48$, $df = 226$, ns).

4. DISCUSSION

There was no significant difference between Finnish- and Swedish-speaking workers in the sum variables measuring safety climate and safety action. We conclude that safety culture as a function of safety climate and safety action does not explain the huge difference (20–30%) in the accident frequency between two language groups. However, safety culture in Swedish-speaking companies was a little better in many variables than that in Finnish-speaking companies. Perhaps Swedish-speaking companies had implemented good safety culture in Sweden better than Finnish-speaking companies.

Although there were no significant differences between Finnish- and Swedish-speaking workers in the sum variables of safety climate and safety action, based on the differences in the single items of these scales, some indication of different ways to evaluate safety climate can be seen in the two language groups. Finnish-speaking workers stressed more their own personal responsibility for safety. Swedish-speaking safety climate was more collective; they assessed the contribution of the top management and supervisors more positively than Finnish-speaking workers. However, it would

be an exaggeration to talk about two different yet parallel Finnish- and Swedish-speaking safety climates, because the differences between the language groups are so small.

Factor analysis of safety climate strengthened the aforementioned conclusion. The factor structure of the evaluations of Finnish- and Swedish-speaking workers about the safety climate of their companies was very similar. The analysis nevertheless showed that the workers in both language groups differed as regards their own attitudes and those of the management. Because factor analysis was done only with safety climate, the results included two factors instead of four factors [18, 32, 33] also including other items.

One of the major problems of this study is the definition of mother tongue. In the field situation the respondents had to choose whether to fill out a Finnish or a Swedish version of the questionnaire. In such a situation a perfectly bilingual person might choose the language which is that of the majority in the company. Thus, mother tongue is not an entirely unambiguous concept in this study.

Accident frequency was significantly higher in bilingual than in Finnish- or Swedish-speaking companies. We must be cautious with this result, however, because it is based on two companies only. However, it could be a sign that the language barrier causes disturbances in the flow of information, which increases the risk of an occupational accident [34].

Although we used a non-standardized questionnaire in our study, Cronbach's alpha coefficients of the measurements were above the acceptable level of .80. The coefficients were on the same level as in the previous studies in which this Finnish questionnaire was used [18, 32]. We conclude that the questionnaire functioned well, although there were no differences in safety climate between Finnish- and Swedish-speaking workers.

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