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Results of Implementing Programmes for Modifying Unsafe Behaviour in Polish Companies

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This article presents the results of 3 Polish companies implementing programmes for modifying unsafe behaviour. Those programmes involved training workers and supervisors, and observing, registering and analysing the workers' behaviour. They focused on the quality of life and safety culture as factors key to the level of unsafe behaviour and, thus, to the level of safety in an organisation. To assess the effectiveness of the programmes, the quality of life and safety culture were studied before, during and after the intervention. The implementation of the programmes resulted in a higher level of safety culture and workers' well-being and fewer cases of unsafe behaviour. The improved level of safety culture and well-being was different in each company.

safety culture well-being OSH MS effectiveness behaviour-based safety companies

1. INTRODUCTION

Occupational safety and health (OSH) used to be perceived primarily in terms of technology and medicine. However, experience of the past 40 years demonstrated that OSH indicators in companies did not improve as radically as expected despite technologically advanced working tools and state-of-the-art methods of work [1]. It turned out that, at a certain level of organisation maturity, limiting investment in safety to the cost of safe machines and equipment only was insufficient. There had to be more focus on human resources and management methods in the context of OSH. This started in the 1970s, when stagnation in OSH brought a search for key factors in improving OSH in companies.

A behaviour-based approach to safety at work is not new. Its beginnings go back to Heinrich's research in the 1930s and 1940s [2]. He wrote that improper working conditions caused only 10% of occupational accidents and diseases, whereas workers' unsafe behaviour caused as much as 88%. Later U.S. publications confirmed Heinrich's studies [3, 4].

Similar studies were performed in other countries as well, e.g., a study of 443 workers in Israel showed that their behaviour was unsafe in 33.8% of their activities and that failure to use or improper use of personal protective equipment (PPE) caused 44% of all occupational accidents and diseases [5].

According to Studenski, certain specific negative features of safety culture increased the probability of the occurrence of occupational accidents, occupational diseases and catastrophes [6].

Those facts increased interest in programmes aimed at modifying unsafe behaviour as an effective means of preventing accidents. They are primarily promoted in the USA and Canada; however, there is a growing interest in these programmes in other countries, too. Numerous studies over several years

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demonstrated that implementing such programmes resulted in a decreased number of occupational accidents. Moreover, the results of implementing a programme and the level of safety culture are closely related [7, 8, 9, 10, 11, 12].

Manuele criticised the practical implementation of programmes aimed at modifying unsafe behaviour [13]. Manuele's major objection was that the blame and responsibility for occupational accidents and occupational diseases shifted to workers. This is true unless the implementation of such programmes is based on identifying the causes of unsafe behaviour. Programmes for modifying unsafe behaviour cannot replace conventional OSH management. These two approaches should coexist because changes in workers' behaviour are not likely if the working environment and organisation factors are not considered. On the contrary, workers who are observed only can perceive a behaviour observation programme as the management's attempt to avoid investing in occupational safety improvements and, consequently, perceive such a programme as a convenient way of the management's avoiding responsibility [14]. According to Maciejewicz, observation programmes attempt to answer the question why people act in an unsafe manner. What is it that does not allow them to work safely? To find the answers, we have to analyse data collected during the programme, draw some conclusions and eliminate barriers [15]. No proper training, no awareness of hazards and no proper communication in OSH may be some of the causes of unsafe actions. Such causes actually indicate that errors may be attributable to both the employer and the workers.

The programmes for modifying unsafe behaviour discussed here are based on the assumption that safety culture (and activities undertaken in an organisation) and the quality of life are key factors for unsafe behaviour. In this context, safety culture is understood mainly as consciousness, responsibility, commitment and other behaviour present and developed. The quality of life is understood as workers' psychosocial and physical well-being, including perception of the quality of the working environment as well as their expectations regarding changes at work. So, modifying and improving thus defined safety culture and the quality of life will improve the level of unsafe behaviour and occupational safety. On the other hand, the level of occupational safety can be diagnosed with the level of safety culture and the quality of life.

2. METHODS

2.1. Methodology

This project aimed at implementing programmes for modifying unsafe behaviour in Polish companies and assessing their results. The programmes involved training workers and supervisors, and observing, registering and analysing workers' behaviour. Once registered, the workers' unsafe behaviour was analysed to plan and execute proper corrective and prevention measures. Figure 1 presents the process of implementing a programme.

The first stage of intervention consisted of training and consultations aimed at explaining the grounds for, and the process of, implementing a programme with a view to modifying unsafe behaviour in companies. It also focused on presenting issues related to safety culture; this was to make workers sensitive to other workers' and their own unsafe behaviour. The next stage included observing and registering unsafe behaviour; a core part of the programme. Rank-and-file workers and representatives of the management in charge of implementing the programme performed those activities. It is noteworthy that while the workers were encouraged to observe and register unsafe behaviour of other workers during the whole working day, the management did that irregularly with the exception of company B, where regular (a few times per reporting period) behavioural audits took place.

Given the purpose of this project, unsafe behaviour was defined as any type of action of a worker or a visitor on the company premises, which was in breach of safety rules and regulations. This included tolerating other people's unsafe behaviour.

A checklist for registering behaviour was developed to standardize information on unsafe behaviour collected in various companies and to sim-

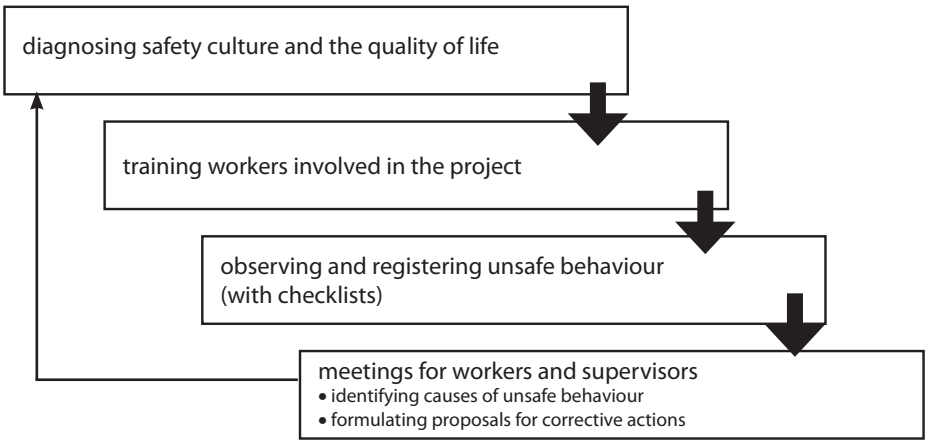


Figure 1. The process of implementing programmes for modifying unsafe behaviour.

plify the procedure for registering workers' unsafe behaviour. This checklist classified behaviour in four groups:

- when PPE was
  - not used,
  - improperly used,
  - damaged,
  - there were other irregularities in using PPE;
- when means of work, machines and equipment were
  - unsuitable for a given type of work,
  - used incorrectly,
  - in bad repair or not properly maintained or substandard,
  - missing covers or protective devices or covers or the protective devices were in bad repair,
  - there were other irregularities in using means of work, machines and equipment;
- when the workstation
  - was untidy,
  - had waste and spilt liquid on the ground,
  - did not have proper access,
  - there were other irregularities related to the workstation.

The fourth group involved other behaviour, e.g.,

- work done by a worker unauthorised to do it, or without a written permit to do the work, or work done in breach of an instruction or procedure,
- a worker's arbitrary, irresponsible behaviour,
- drinking alcohol at work,
- starting work under the influence of alcohol,
- smoking in the presence of others,
- turning a blind eye to unsafe behaviour (silent acquiescence),
- failure to report hazards and dangerous occurrences,
- incompliance with other procedures and safety rules, and other irregularities.

Information on unsafe behaviour was collected anonymously during six reporting periods of 6–8 weeks each. The length depended on the current situation in the company and the workers' workload. A meeting took place after every reporting period. The workers in the programme and those acting on behalf of the company took part. Their aim was to identify causes of unsafe behaviour and to suggest preventive and corrective measures acceptable to all workers.

A checklist was developed to help identify causes of unsafe behaviour:

- pace of work;
- lack of, or improper, training;
- being unaware of risk;
- no communication;
- no motivation;
- unsuitable, unrealistic, hard-to-understand or unknown procedures;

- no supervision;
- bosses setting a wrong example.

The checklists for registering cases of unsafe behaviour and identifying their causes were then returned to the authors of the project.

2.2. Effectiveness

Studies to assess the effectiveness of the programmes for modifying behaviour took place three times: before (study I), during (study II) and after the intervention (study III). They covered the workers in the programmes and involved standardised tools (survey questionnaires). The questionnaires were anonymous to ensure truthful responses.

Checklists described in section 2.1 were used to register changes in the number of cases of unsafe behaviour.

Safety culture was measured with a questionnaire developed in CIOP-PIB [16]. Specific items measured

- commitment and participation of the management, or the extent to which the management and the workers were committed to taking actions aimed at improving OSH;
- OSH training and accident analysis (further referred to as training) to find out whether, and if so, to what degree, the know-how shared at training sessions and meetings was used; also whether causes of accidents were discussed with workers;
- core values, or how important the workers' safety was in the company;
- relations among workers and a sense of belonging to the company (further referred to as relations) to find out the effectiveness of communication on OSH matters in the company and whether workers felt important to the company;
- responsibility and awareness, or how much responsibility for their own and other persons' safety workers accepted and to what extent they were aware of risks;
- safe behaviour, or how workers reacted if they noticed unsafe behaviour and whether they themselves behaved unsafely.

To assess safety culture quantitatively, the semantic differential was used. Each answer scored as follows: *I definitely agree* = 5, *I quite agree* = 4, *It is hard to say* = 3, *I rather do not agree* = 2, *I definitely disagree* = 1.

In this project, the quality of life meant workers' psychosocial and physical well-being as well as their expectations regarding changes at work. The quality of life was measured with a standardised questionnaire on psychosocial working conditions, largely based on the occupational stress questionnaire [17] with a 5-point Likert-type scale to assess the quality of life. To diagnose safety culture, the respondents indicated their views on issues related to their work and their sense of well-being.

2.3. Study Group

The programme for modifying unsafe behaviour covered 50 workers directly from the production floor in four companies.

Company A was a construction company. OSH specialists supervised the implementation of the project.

Company B was a sugar plant. A team of auditors, who did behavioural audits, supervised the project on behalf of the company. Because employment in this company was seasonal, to ensure the same workers participated in the entire project, the project was shorter than in the other companies. A reporting period lasted one month. Company B did preliminary and final diagnoses of safety culture only, so the programme lasted 6 months.

Company C was a manufacturing company. The implementation of the project was supervised, on behalf of the company, by a team comprising supervisors and the safety and environment manager. Furthermore, the company management delegated all power related to the project to the safety and environment manager. After a month, company C withdrew from the project because it was too challenging and involved too much work in times of a financial crisis. However, the company agreed to continue participating in the study of safety culture and the quality of life as a control company.

Company D was a car servicing company. An OSH inspector and a human resources specialist supervised the project on behalf of the company.

The reporting periods for company D were irregular. Due to the situation in the company and the workload, they ranged from 6 to 8 weeks. In this company, the programme lasted 10 months.

3. RESULTS

Tables 1–2 present mean values of indicators measured in three consecutive studies (before, during and after the implementation) in line with the adopted methodology.

When the maximum value of an indicator was 5, the level of safety culture and welfare was high and the workers did not think any changes were necessary. When the value was 1, the level of safety culture and welfare was low and urgent changes were necessary.

3.1. Quality of Life

As regards well-being and necessary changes, the intervention brought most changes in company B (~35%), and fewest in company A (~1%). In all cases, the differences between the mean and the median were relatively low (the distribution of values for specific indicators was approximately symmetrical). The higher the indicator of necessary changes, the lower the need for change felt by the workers (Table 1).

In company A, the workers assessed their physical well-being as good (4.00) and their psychosocial well-being as slightly worse (3.75). The lowest value was recorded for the need for change indicator (~3.30). In particular, the workers expected a slower pace of work and more detailed instructions. In company A, there was a slight increase in the indicators of psychosocial well-being and need for change during the implementation of the programme for modifying unsafe behaviour (Table 1).

In company B, there was a dramatic increase in physical (by almost 39%) and psychosocial (by 35%) well-being in study III compared with study I, and a slightly lower increase in the indicator of the need for change. This increase can be explained by the company's experience in implementing similar projects. The company had conducted behavioural audits based on DuPont's methodology for years. However, rank-and-file

TABLE 1. Mean Values for Well-Being and Need for Change at Work

	Physical Well-Being			Psychosocial Well-Being			Need for Change at Work		
Study	**I**	**II**	**III**	**I**	**II**	**III**	**I**	**II**	**III**
				company A					
M	4.03	3.99	4.01	3.75	3.76	3.79	3.34	3.34	3.37
Changes compared with study I (%)		–1.0	–0.5		0.3	1.2		0.1	1.0
Changes compared with study II (%)			0.4			0.9			0.9
				company B					
M	2.95		4.10	2.89		3.90	2.67		3.59
Changes compared with study I (%)			38.8			35.0			34.6
				company C					
M	2.77	3.89	3.82	2.66	3.52	3.49	2.85	3.33	3.30
Changes compared with study I (%)		40.3	37.9		32.2	31.1		17.0	15.8
Changes compared with study II (%)			–1.7			–0.8			–1.1
				company D					
M	3.19	4.03	4.09	3.08	3.79	3.86	2.55	3.22	3.15
Changes compared with study I (%)		26.5	28.3		23.0	25.2		26.2	23.5
Changes compared with study II (%)			1.4			1.7			–2.1

Notes. I, II, III = studies. Mean values were measured before intervention (I), during intervention (II) and after intervention (III); maximum value: 5. Source: own calculations.

workers had not been involved in the audits, not to mention temporary workers, who represented a large share of the company's workers. Implementation of programme for modifying unsafe behaviour enabled the company to increase the staff competences and upgrade them among the workers who were earlier excluded from similar projects. In company B, like in company A, indicators of physical well-being were higher, and those of the need for change were the lowest (Table 1).

In company C, like in company B, there was a dramatic increase between studies I and II in both physical (by 40%) and psychosocial well-being (by 32%) and a slightly lower increase in the need for change (17%). In study III, there was a slight decrease in all three indicators probably because company C withdrew from the programme. Like in the other companies, the workers in this company considered the physical aspects of their well-being to be slightly better than the psychosocial ones. The need for change scored slightly higher in study I than well-being, and the workers assessed the need for change to be slightly worse in study III.

In company D, physical well-being was evaluated to be the best, with the need for change scoring the lowest. Like in the other companies, there was a dramatic increase in study II compared with study I (by ~25% in each case) and an insignificant increase (by ~1%) in well-being in study III compared with study II. In study III, there was a decrease of 2% in the need for change. Perhaps this drop can be attributed to the workers' increased awareness and higher requirements concerning their current work (Table 1).

3.2. Safety Culture

In company A, workers employed by subcontractors evaluated responsibility and awareness to be the best (4.70 in study III), whereas safe behaviour was evaluated slightly worse (4.64). Commitment and participation were evaluated as good. Training and relations scored the lowest (3.71 and 3.81, respectively). The increase was highest in safe behaviour (by 12%, including an increase of 11% between studies I and II). The increase was lowest for responsibility and awareness, which were highest in study I. The only decrease between study I and II was noted in relations (Table 2).

In company B, responsibility and awareness scored the highest (4.29 in study III), whereas safe behaviour was evaluated only slightly lower (4.21). Relations scored 4. The other indicators ranged between 3.56 and 3.92 with training scoring the lowest; it also improved the least. What is more, the score increased the least in study I, too. The highest increase was in safe behaviour (by 19%) and relations (by 14%) with the evaluation results of ~3.50 in study I (Table 2).

In company C, the highest indicators were obtained in study I, the lowest in study III. Responsibility and awareness scored the highest (3.80–3.90). Training and safe behaviour also scored over 3 in each study. In study I, relations and commitment and participation were evaluated at over 3, but the score dropped to under 3 in study III. Values scored under 3 in each study (including the lowest score of 2.78 in study III). The most pronounced decrease was noted in relations (by ~10.40%). In study II, only indicators of training and responsibility and awareness increased, and only the indicator of safe behaviour increased slightly in study III, but the growth in each case was insignificant (Table 2).

In company D, responsibility and awareness scored the highest (4.31 in study III); safe behaviour scored slightly lower (close to 4); however, in study I, it had the lowest level (3). Training was assessed at slightly over 3 (only the value of this indicator dropped between studies I and III). Whereas study II revealed an increase in safe behaviour only (by 27.50%) and a very insignificant one in relations, all the indicators increased between studies II and III, when the highest total increase was in safe behaviour (over 31%). The increase in commitment and participation and in values was significant at 14–15%. There was a slight increase in the indicators that were the highest in study I (Table 2).

3.3. Unsafe Behaviour and Its Causes

Monitoring programmes aimed at modifying unsafe behaviour showed that they brought a higher level of safety culture, as demonstrated by the falling number of cases of unsafe behaviour.

TABLE 2. Mean Values for Safety Culture

	Commitment and Participation			OSH Training and Accident Analysis			Core Values		
Study	**I**	**II**	**III**	**I**	**II**	**III**	**I**	**II**	**III**
					company A				
M	3.84	3.92	4.06	3.55	3.61	3.71	4.26	4.28	4.28
Changes compared with study I (%)		2.1	5.6		1.4	4.2		0.4	0.5
Changes compared with study II (%)			3.4			2.8			0.1
					company B				
M	3.58		3.72	3.48		3.56	3.71		3.92
Changes compared with study I (%)			4.0			2.3			5.7
					company C				
M	3.25	3.19	2.99	2.95	2.91	2.78	3.28	3.32	3.13
Changes compared with study I (%)		–2.0	–8.1		–1.2	–5.8		1.2	–4.6
Changes compared with study II (%)			–6.3			–4.7			–5.8
					company D				
M	3.48	3.45	3.97	3.19	3.07	3.15	3.40	3.40	3.92
Changes compared with study I (%)		–0.7	14.2		–3.6	–1.2		0.0	15.3
Changes compared with study II (%)			15.0			2.5			15.3

	Relations [1]			Responsibility and Awareness			Safe Behaviours		
Study	**I**	**II**	**III**	**I**	**II**	**III**	**I**	**II**	**III**
					company A				
M	3.74	3.73	3.81	4.50	4.70	4.73	4.14	4.60	4.64
Changes compared with study I (%)		–0.3	1.9		4.4	5.0		11.0	12.0
Changes compared with study II (%)			2.2			0.5			0.9
					company B				
M	3.53		4.02	4.15		4.29	3.54		4.21
Changes compared with study I (%)			14.1			3.5			19.0
					company C				
M	3.24	3.01	2.90	3.93	3.97	3.83	3.23	3.20	3.21
Changes compared with study I (%)		–7.0	–10.4		1.1	–2.5		–1.0	–0.7
Changes compared with study II (%)			–3.7			–3.6			0.3
					company D				
M	3.56	3.58	3.70	4.12	4.12	4.31	3.06	3.90	4.02
Changes compared with study I (%)		0.4	3.8		0.0	4.7		27.5	31.3
Changes compared with study II (%)			3.4			4.7			3.0

Notes. OSH = occupational safety and health; 1 = relations among workers and a sense of belonging to the company; I, II, II = studies. Mean values were measured before intervention (I), during intervention (II) and after intervention (III); maximum value: 5. Source: own calculations.

There was a dramatic decrease in registered unsafe behaviour in all companies in reporting period 1, which was followed by a period of stabilisation and a gradual decrease in the number of cases of unsafe behaviour registered in consecutive reporting periods.

Such a dramatic decrease followed from eliminating unsafe behaviour persistently repeated by the same workers (Figures 2a–c). At the same time, there was a slight decrease in or a stabilised number of identified causes of unsafe behaviour in all companies (thus, there was either an increased or a fixed number of identified causes of unsafe behaviour per each case of unsafe behaviour). This, given the increased number of such causes, may mean the level of awareness

could be higher among those in charge of implementing programmes for modifying unsafe behaviour. All this confirms the importance of the causes of unsafe behaviour and the need to identify causes of such conduct for future prevention. On the other hand, the increased number of identified causes of unsafe behaviour can also mean the workers in the programme became more committed to implementing the programme and, consequently, identifying those causes.

The most frequently registered causes of unsafe behaviour included no supervision, inadequate awareness of hazards and pace of work. The quality and the effectiveness of training scored lowest in the workers' evaluation of the elements of safety culture in all companies. Moreover, also this study of the quality of life showed that the workers felt they needed to have more training, to upgrade their qualifications and to receive more detailed instructions. It was also found that the causes and circumstances of past accidents had not been discussed with the workers, so the company had not used the experience and lessons learnt in this area to enhance the workers' expertise and to increase their awareness. The second element that scored the lowest in the assessment by the workers was the top management's commitment, usually manifested by their interest in whether workers do their work safely.

3.4. Initial and Subsequent Values of Indicators

Comparing the initial value of an indicator and its later changes helps to assess the effectiveness of the intervention. If there was no correlation between the initial value of an indicator and its changes, the intervention was equally effective among all workers, regardless of their initial situation. Negative correlation indicated the intervention was most effective in the group of workers where low values of a given indicator were recorded (negative correlations are party caused by saturation of a given indicator value, e.g., if the indicator value concerning a worker is near maximum, then there is hardly any possibility for the indicator to increase). Greatly interesting is the situation where the observed correlations are

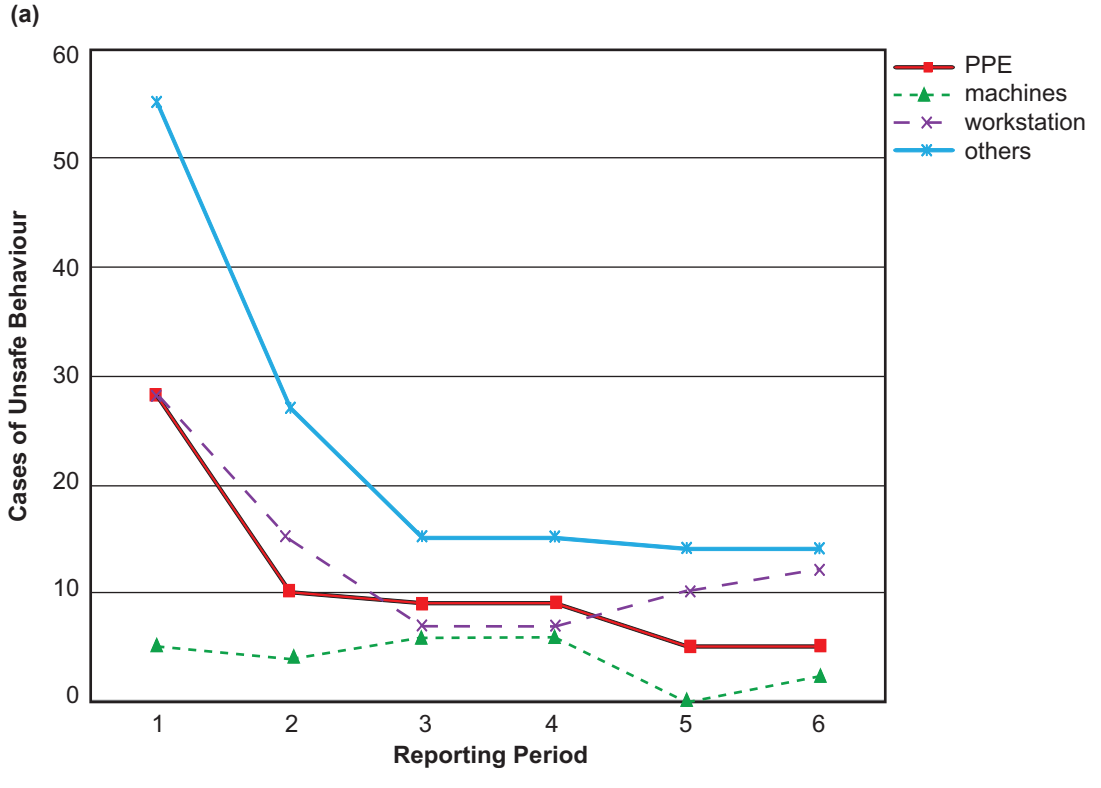
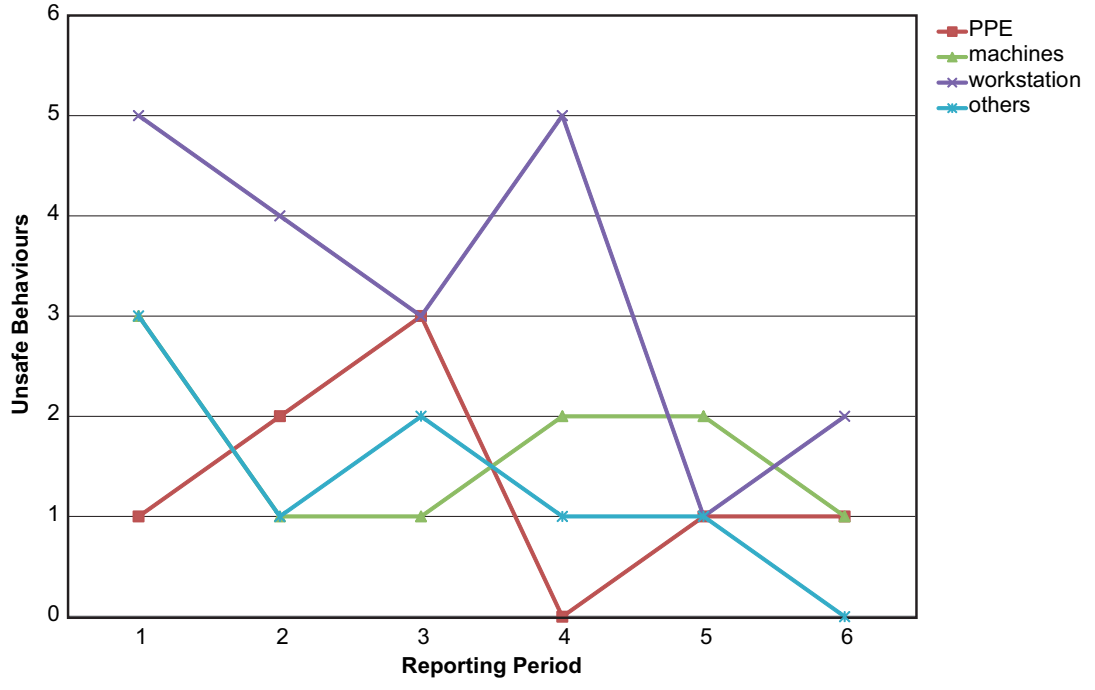


Figure 2. Registered unsafe behaviour in reporting periods in (a) company A, (b) company B and (c) company D. *Notes*. PPE = personal protective equipment.

(b)



(c)

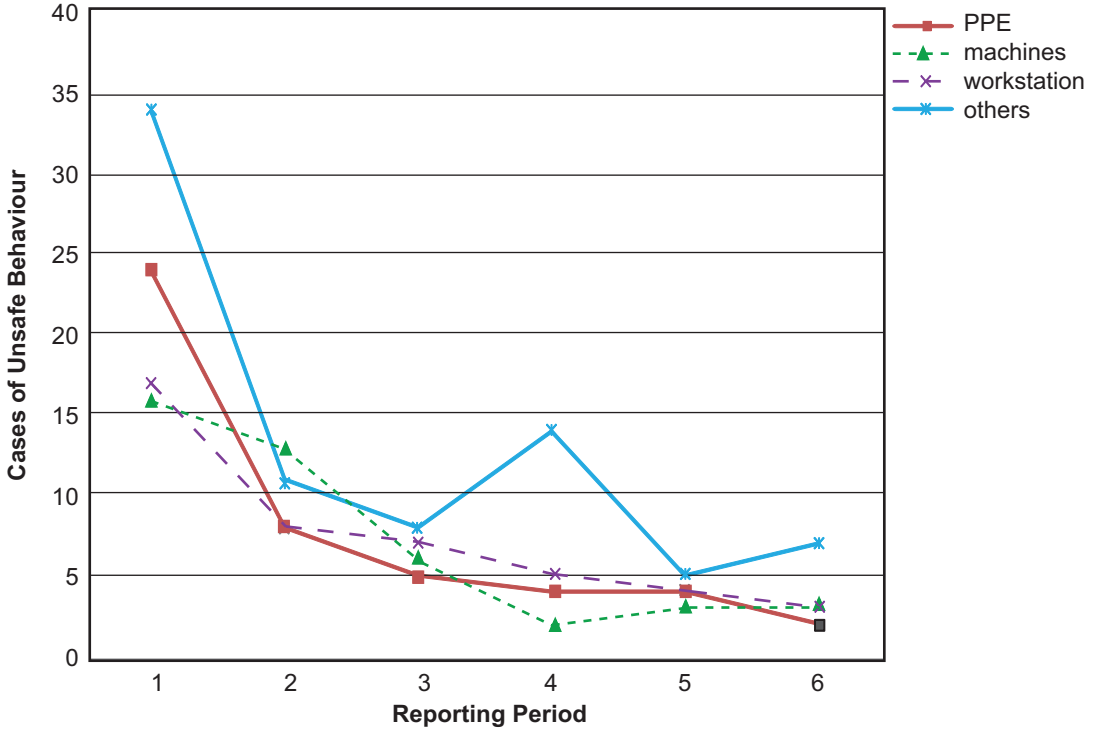


Figure 2. (*continued*)

positive. In this case, the intervention improved primarily the situation of workers in the group where the psychosocial conditions at work were better than the mean value for the entire company. This development can be observed in a number of different setups (e.g., at the time of Internet expansion) according to the rich-get-richer rule.

Table 3 lists correlation indicators. The value of only one indicator, i.e., that concerning the need for change felt by workers is not correlated with its initial value in all the companies covered in the project. Positive values of the correlation coefficient occur only for those factors, where changes of mean values are only minor and of no statistical significance.

3.5. ANOVA

Analysis of variance (ANOVA) assesses whether there are statistically significant differences among the values of indicators (of the quality of life in specific companies, etc.) that were measured at different stages of the intervention, so that an answer can be given as to whether the values of indicators depended on the intervention in a company or whether the observed changes of the mean values of indicators resulted from random internal changes within the group. The differences between the mean values were considered statistically significant at $p < .05$.

Intervention in company A brought significant changes in responsibility and awareness ($p < .001$) and safe behaviour ($p < .001$). In company B, the intervention brought significant changes in physical well-being ($p < .001$), psychosocial well-being ($p < .001$), need for change ($p < .001$).

As the parameters indicating safety culture were measured in company B only twice, the mean values were compared with a paired test. A *t* test analyses changes in a population (or the differences between the final and initial values) and compares the mean value of change for a given variable with zero. The following results were obtained: core values ($p = .001$), relations ($p < .001$), responsibility and awareness ($p = .002$) and safe behaviour ($p < .001$). The differences in the mean values of the other indicators were not statistically significant.

In company C, the intervention resulted in significant changes in physical well-being ($p < .001$), psychosocial well-being ($p < .001$), need for change ($p = .015$) and relations ($p = .009$).

In company D, the intervention brought significant changes in physical well-being ($p = .013$), psychosocial well-being ($p = .05$), commitment and participation ($p < .001$), core values ($p < .001$) and safe behaviour ($p < .001$).

TABLE 3. Correlation Between Initial (Before Intervention) and Subsequent (After Intervention) Values of Indicators

	Company			
Indicator	**A**	**B**	**C**	**D**
Physical well-being	.34*	–.77*	–.77*	–.77*
Psychosocial well-being	.14	–.75*	–.57*	–.54*
Need for change at work	.01	.14	.05	–.07
Commitment and participation	–.79*	–.82*	–.40*	–.42**
OSH training and accident analysis	–.68*	–.45*	–.01	–.68*
Core values	–.88*	–.81*	–.64	–.85*
Relations among workers and sense of belonging to the company	.29**	–.81*	–.12	–.66*
Responsibility and awareness	–.67*	–.49*	–.46*	–.79*
Safe behaviour	–.83*	–.83*	–.33*	–.57*

Notes. *$p < .01$, **$p < .05$; OSH = occupational safety and health. Source: own calculations.

4. DISCUSSION AND CONCLUSIONS

It is surprising that the workers involved in the programme for modifying unsafe behaviour gave their own risk awareness as an element of safety culture the highest score, along with a sense of responsibility for their own safety and that of other workers. However, their knowledge in this respect was not verified in practice. There was no correlation between training and the workers' sense of responsibility and awareness in any company.

In study I, the workers in companies A and B considered their own safe behaviour to be very good. In these companies, safe behaviour was strongly and positively correlated with all elements of safety culture. When assessing awareness of safety and safe behaviour, it is important to consider possible acceptance of deviation, i.e., long-standing acceptance of a constantly increasing risk when no accident has occurred for a long time in a potentially dangerous situation.

The analysis of the impact of programmes for modifying unsafe behaviour on the level of safety culture leads to the conclusion that safety culture is a good instrument for measuring the effectiveness of such programmes. In company C, which withdrew from the project, there was a slight decrease in all elements of safety culture in consecutive studies, whereas there was an increase in those elements in the other companies, with the highest increase in safe behaviour: 12.0% in study III compared with study I in company A, and 19.0 and 31.3% in companies B and D, respectively. An increase of over 5.0% was recorded in other elements of safety culture: commitment and participation (from 5.6% in company A to 15.0% in company D), values (from 5.7% in company B to 15.3% in company D), responsibility and awareness (5.0% in company A) and relations (14.1% in company B).

The situation is different in the quality of life measured with the workers' well-being and their need for change in the working environment. Regardless of the results and identified trends, research on the quality of life in each of the four companies showed that workers considered physical well-being as better than psychosocial well-being. However, both were generally evaluated as good in study III. In this respect, the increase was greatest in company B, where physical as well as psychosocial well-being scored under 3 in study I. The results were similar in company C, but only in study II. The indicators that dropped in company C in study III (after its withdrawal from the programme) and in company A after study II compared with study I can be attributed to the fact that, as a result of the programme that increased the workers' responsibility and awareness, the workers became more critical about their working environment. It must be pointed out that well-being is affected by many factors, including workers' financial and family situation as well as their health. Therefore, the results on the workers' well-being must be interpreted cautiously unless additional interviews are carried out.

The indicator measuring the workers' need for change increased to over 3 in study III in each company (i.e., their need decreased) probably because they noticed the positive changes the programme brought.

The results indicate that the entire programme increased not only the workers' awareness of OSH, but also their sense of responsibility for their own and their co-workers' safety. Companies which had regular OSH-related activities also scored better in their workers' evaluation of OSH and aspects of the working culture. Even in company C, which withdrew from the project, the workers' greater awareness resulted in lower scores in their evaluations after the onset of the project.

It is not surprising that indicators increased relatively little, where they were initially highest. In company B, which had the highest initial values of indicators, i.e., in study I, the knowledge and awareness of the matters covered in the survey were the highest among the company management and staff; therefore, the potential for improvement was the lowest.

Nevertheless, it is clear that the overall score increase in the evaluation of specific aspects means that the workers noticed an improvement

in material and organisational standards of OSH in their companies.

Even though it is difficult to answer it, the important question is how the increased workers' awareness of their working environment affects their perception and, consequently, the scores they gave when evaluating the working environment in consecutive studies.

The results suggest that programmes for modifying unsafe behaviour positively affect the effectiveness of OSH management as manifested by

- lower indicators of occupational accidents;
- lower indicators of sickness absence;
- improved physical and psychosocial well-being of workers resulting from the working conditions;
- reduced need for change in the material and nonmaterial working environment;
- higher level of safety culture.

Furthermore, it must be pointed out that statistical indicators (e.g., rates of occupational accidents or sickness absence) are easy to use because they are readily available at all times. However, their use in evaluating the effectiveness of OSH management is considerably limited. Firstly, the effects of better effectiveness of OSH management are postponed, so such indicators are useful in the long run only, with observations made over many years. Secondly, these indicators are very sensitive to factors originating in the external environment of a given company, e.g., its legal status and the economy. They translate into personal relations and the level of production (reduced in times of an economic crisis). Thirdly, statistical indicators establish the effectiveness of different measures a posteriori only, when occupational accidents have already occurred. They do not make it possible to identify current problems or ways to solve them to avoid accidents or diseases in the future. Therefore, statistical indicators show there is a problem only if there are aftereffects, so they are in fact, aftereffect indicators.

Thus, other indicators are much more suitable for measuring the effectiveness of OSH activities: safety culture, the quality of life perceived as well-being, and the need for change. However, it must be borne in mind that safety culture and well-being develop gradually, so there can be no immediate radical changes after the implementation of a programme for modifying unsafe behaviour. Instead, care must be taken to ensure that these programmes are continued for many years.

Two indicators prove if a programme for modifying unsafe behaviour has had an impact the effectiveness of OSH management:

- a decreasing number of cases of unsafe behaviour; and
- an increasing number of cases of safe behaviour manifested by at least the use of PPE, discontinued bad habits and routines, active measures to enhance safety and compliance with safety rules and procedures.

Many factors come into play in determining the impact of programmes on OSH management. They comprise both external factors (e.g., unemployment rate, economic crisis, provisions of law and contractual requirements) and internal ones (e.g., commitment on the part of the management and staff to implementing programmes for modifying unsafe behaviour, the style of management). Next come the knowledge and skills of persons implementing such programmes, type of business activities and existing hazards as well as the size of the company. If measuring the effectiveness of OSH management by measuring the workers' well-being, it should be borne in mind that some other external factors, such as the workers' general health or their financial and family situation, have an impact on their well-being, too. The initial value of the indicators is also important. The higher its value, the less potential there is for improvement, which does not mean that companies with an effective OSH management system should not be interested in implementing such programmes. On the contrary, experience indicates that the higher the level of an OSH management system, the more interested and committed the employers are because such programmes enable even further improvement.

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