

EFFECTIVE SUPERVISORY SAFETY LEADERSHIP BEHAVIOURS IN THE OFFSHORE OIL INDUSTRY

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The first line supervisor has been identified as having a critical role in the management of safety. This paper presents the results of a study that investigated the attitudes, behaviours and skills that influences of their subordinates level of safety. The majority of supervisors indicated that they had positive safety management attitudes and that they displayed high levels of positive safety leadership behaviour. Analysis revealed that a number of the supervisor behaviours had a significant impact on subordinate safety behaviour. The aspects of supervisor behaviour that appeared to impact on subordinate safety included, valuing subordinates, visiting the worksite frequently, work group participation in decision making and effective safety communication. The study confirmed the importance of the first line supervisor in the management of safety. The findings highlight the importance of the interpersonal relationship between supervisors and their subordinates. It was concluded that interpersonal and work group dynamics have a significant impact on safety performance.

INTRODUCTION

This project was designed to investigate the role of the offshore supervisor in safety and accident prevention. The study was sponsored by BP Exploration, Phillips Petroleum, AMEC Process and Energy and the Offshore Safety Division of the UK Health and Safety Executive. This is the second study to investigate offshore supervisors' management of safety. The previous study, by Mearns, Flin, Fleming and Gordon, (1997) used a semi-structured interview technique, to identify the behaviours and attitudes of supervisors that manage safety effectively. They identified a number of factors that distinguished effective from less effective supervisors. The purpose of this study was to investigate if the previous findings could be replicated using a different experimental method. In addition, it was felt that it would be of interest to investigate how supervisor safety behaviours interacted with other organisational factors such as 'perceived management commitment to safety'.

In recent years, there has been an increasing recognition in high reliability industries of the importance of the cultural and behavioural aspects of safety management. An increasing number of studies have been carried out investigating safety culture in safety critical industries, for example Cox and Cox (1991) and Lee, MacDonald and Coote (1993). In addition to this, a number of books have recently been published discussing the factors which underpin safety culture, for example Reason (1997) and Turner and Pidgeon (1997). In parallel with these scientific investigations, individual companies and industry groups have embarked upon a number of safety culture improvement initiatives, for example the STEP change initiative in the offshore oil industry.

The overall aim of this project is to investigate the impact offshore supervisors have on their subordinates, accident involvement, and safety behaviour, in order to identifying the attributes or behaviours of supervisors who manage safety effectively.

METHOD

The method for this study was based on procedure used by Mearns et al (1997) in their investigation of offshore supervisors' management of safety. They used a semi-structured interview technique to investigate what attitudes and behaviours supervisors should display in

order to manage safety effectively. The current study involved the development of two self-completion questionnaires, a subordinate safety climate and a supervisor safety management questionnaire. A third questionnaire, superior evaluation form developed by Mearns et al (1997) was also used. These three questionnaires were used for the evaluation of each supervisor by themselves, their subordinates and their superior (a 360-degree evaluation). It was felt that the use of both superior and subordinate evaluations would produce a more accurate measure of supervisors' safety management performance.

The supervisor questionnaires were individually addressed mailed out to all the first line supervisors on the participating platforms. The subordinate questionnaires were distributed to all non-supervisory staff on the participating installations. The OIM's on the installations completed superior evaluation forms for the supervisors involved in the study.

PILOT STUDY

The questionnaires were pilot tested by carrying out 10 face to face interviews onshore with subjects from installations that did not participate in the main study. The interviews involved getting the interviewee to respond to the pilot questionnaire. Any difficulties the interviewee had responding to were noted. The interviewee was then asked to comment on the questionnaire and to suggest any issues, which they felt should be included. The questionnaires were adjusted in the light of the results.

SUPERVISOR QUESTIONNAIRE

This questionnaire was constructed to measure offshore supervisors' perception of the safety climate on the installation and their management style. In addition, two scales were developed to measure the safety leadership behaviours and attitudes, which were identified as important in the previous offshore supervisor study undertaken by Mearns et al, (1997). The questionnaire was split into four sections.

Section one of the questionnaire covered demographic information, which included; supervisor experience, job category and training. Each supervisor was given a personal number, which was printed on the top of the first page, so that their responses could be linked to their subordinate's questionnaires. A letter accompanying the questionnaire explained the function of the number and the purpose of the study.

Section two contained the safety climate scale that was used in the previous study (Mearns et al, 1997). Ten supervisor safety management statements were included in this section of the questionnaire (see section 2.3.1). Section three contained the Fleishman's Leadership Opinion scale (Fleishman, 1953). Participants indicated how often supervisors should perform the activities described by the 40 statements on a five point scale. This scale is designed to measure consideration and initiating structure. The Fleishman scale was used in the previous study. Section four contained the fifteen supervisor safety behaviour statements (see section 2.3.1).

Measuring supervisors' safety management attitudes and behaviours

The Mearns et al (1997) study identified 17 concepts that could be used to describe the factors that were important in supervisor safety management. These concepts covered interpersonal relationships (valuing subordinates), behaviours (visiting the worksite), perceptions (pressure for production) and attitudes (Importance of safety). A series of Chi square tests revealed significant differences between effective and less effective supervisors on eight of the 17 concepts. These included, valuing subordinates, awareness of subordinates feelings, frequency of visiting worksite, motivation for visiting the worksite, work group participation, abdication

of responsibility for subordinates safety, pressure to get the job done: focus on production, safety communication.

The supervisor safety management, attitude and behaviour scales were developed by generating attitude and behaviour statements for each of the above eight concepts that separated effective from less effective supervisors. These scales were altered on the basis of the face to face interviews and after detailed discussions from the steering group.

SUBORDINATE QUESTIONNAIRE

The subordinate questionnaire was developed to measure respondents' evaluation of their supervisor's performance on the safety management behaviours identified in the previous Mearns et al study and the safety climate on the installation. Section one of this questionnaire covered demographic information, which included; supervisor's name, offshore experience, job category and included questions on previous involvement in accidents and dangerous occurrences. The questionnaire also contained the safety climate scale used in the supervisor questionnaire. Section three of the questionnaire contained a safety behaviour scale and a supervisor safety leadership behaviour scale.

SUPERIOR EVALUATION SCALE

The performance of each of the supervisors surveyed was evaluated by their superior using the OIM evaluation scale developed by Mearns et al (1997). This evaluation scale contained twelve performance criteria to rate the supervisor on a six point scale from unsatisfactory to an outstanding performer. The OIMs on the participating installations were given an evaluation scale for each of the supervisors on their installation, who had been sent a questionnaire.

RESULTS

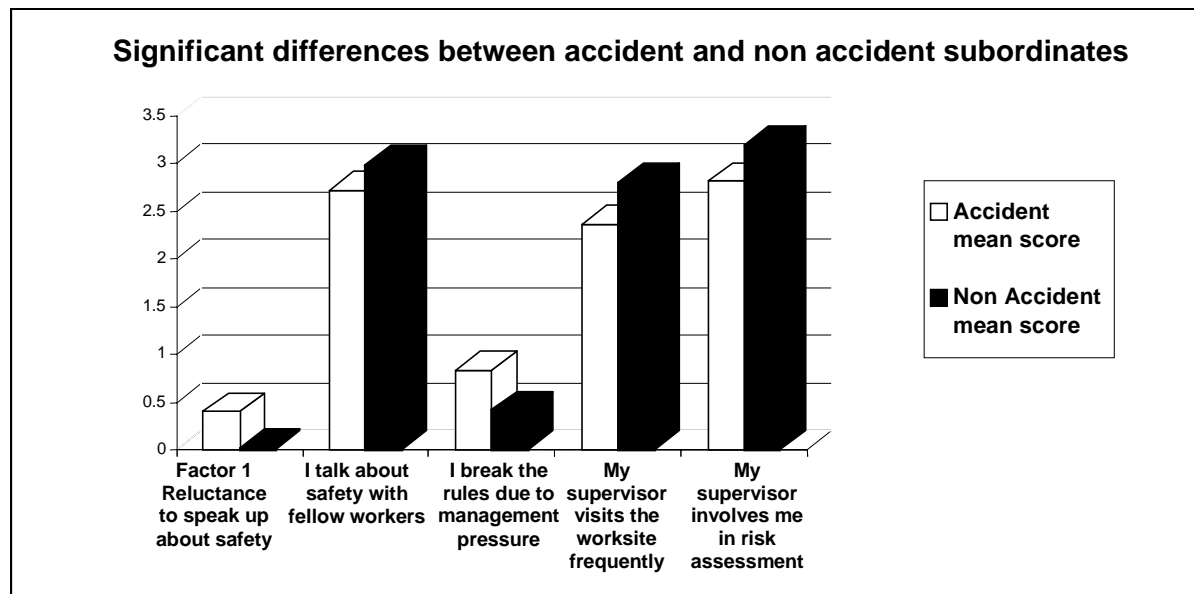
The 'supervisor safety management' questionnaire was returned by 92 of the 140 supervisors who participated in the study, which was a response rate of 66%. The offshore safety management questionnaire was returned by 217 of the 800 subordinate questionnaire that were sent offshore, which was a response rate of 27%. This response rate is conservative because more questionnaires were sent than were distributed to offshore employees. The combined number of questionnaires returned was 309 which is an overall response rate from both the supervisors (n=92) and the subordinates (n=217) questionnaires of 33%. This response rate is conservative because more questionnaires were sent than were distributed to offshore employees. While the response rate is low it is similar to previous offshore studies, for example the Mearns et al (1997) study also had a response rate of 33%. The superior evaluation scale was returned for 129 of the 140 superior evaluation forms that were sent out, which is a response rate of 92%.

DIFFERENCES BETWEEN ACCIDENT AND NON ACCIDENT SUBORDINATES

In section one of the questionnaire subordinates were asked if they had ever been involved in an accident. Of the 217 respondents that completed the questionnaire, 60 (29%) indicated that they had previously been involved in accident. The accident and non accident groups were compared on the following variables: five safety climate factors; the eight safety behaviour statements and the fifteen supervisor safety management behaviour items. These 28 t-test revealed 5 significant differences between the accident and non accident respondents.

Figure 1 presents the results of the statistical tests that revealed a significant difference between the two groups. These results must be treated with a certain amount of caution because the large number of test performed creates the possibility of capitalising on chance. It is therefore possible that one of the findings presented in table 12 is spurious.

Figure 1: Differences between accident and non-accident respondents



It is interesting to note that factor 1 ‘Reluctance to speak up about safety’ was the only safety climate factor where there was a significant difference between accident and non-accident groups. This indicates that non-supervisory staff who believe that people on the installation are reluctant to speak up about safety are more likely to have been involved in an accident. While this finding does not show causation, it is not unreasonable to conclude that employees are more likely to be involved in an accident if they believe that people are reluctant to speak up about safety, which implies a ‘blame culture’ or that safety is not important.

The analysis also revealed a significant difference between the groups on two of the safety behaviour items, one positive ‘I talk about safety with fellow workers’ and one negative ‘I break rules due to management pressure’. This indicates that subordinate safety behaviour is related previous accident involvement, again the direction of causation cannot be shown. Having said that it seems reasonable to conclude that if offshore employees talk about safety with fellow workers and do not break rules due to management pressure they are also less likely to be involved in an accident.

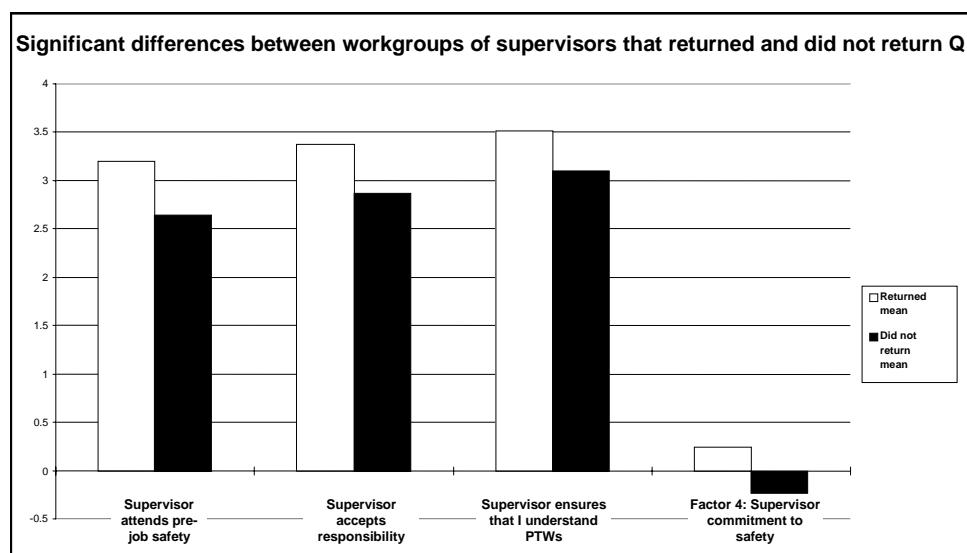
The two supervisor behaviours, which non accident respondents report more frequently are supervisors visiting the work site more than 3 times a shift and supervisors involving them in risk assessments. This indicates that supervisors who manage safety effectively are more likely to visit the worksite frequently and involve their subordinates in decision making. This finding supports two of the primary conclusions from the Mearns et al (1997) study.

SUPERVISORS THAT RESPONDED VERSUS THOSE WHO DID NOT

Every effort was made (individually addressed letters, follow up telephone calls and a second letter with a replacement questionnaire), to ensure that supervisors completed and returned

their questionnaire. It could be argued that not returning the questionnaire may indicate that safety is not a priority for this supervisor. It was therefore decided to create a variable in the subordinate database to identify respondents whose supervisors did not return a questionnaire. This was done so that it would be possible to compare the responses of subordinates with supervisors that did return the questionnaire with those who had supervisors that did not return the questionnaire. Three categories were created, 1, returned the questionnaire; 2, did not return the questionnaire and 3, supervisor identified by the subordinate was not sent a questionnaire. This revealed that the supervisors of 110 of the respondents had returned the questionnaire and 39 of the respondents had supervisors that did not return the questionnaire. The remaining 50 respondents either did not identify a supervisor or named a supervisor that had not been sent a questionnaire. Four significant differences between the two groups revealed and these are presented in figure 2.

Figure 2: Comparison of supervisors that responded with those that did not, on the basis of their subordinates' evaluation of their safety management behaviours



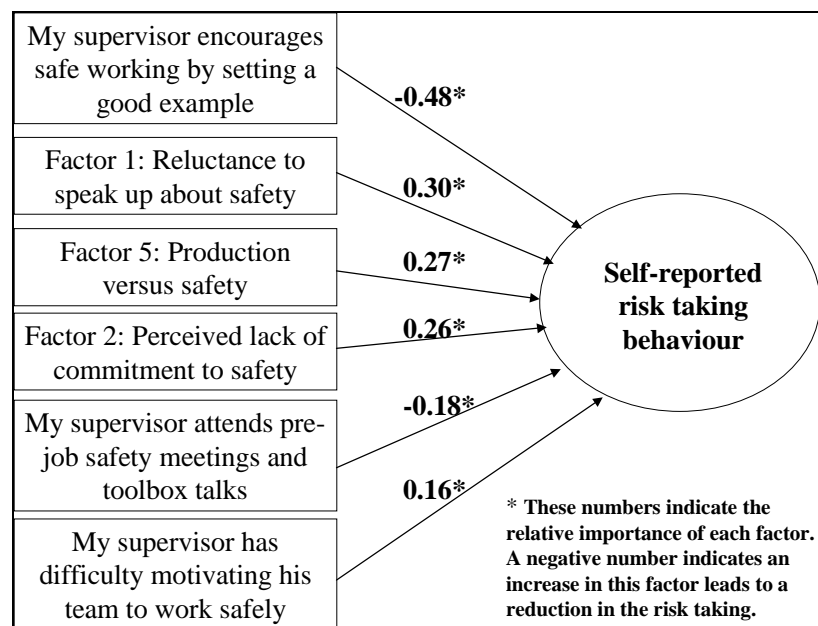
This finding indicates that supervisors who took the time to complete the supervisor questionnaire were perceived to be more concerned about safety by their subordinates. The fact that there are significant differences between the two groups in their subordinates' evaluation of their performance suggests that subordinates are aware of their supervisors' level of commitment to safety. This implies that subordinate perceptions can be used as a measure of supervisors' management of safety. It also indicates that those supervisors who did not return the questionnaire may be less effective in the management of safety. While this finding may not appear to have implications for improving supervisors' safety management, it does lend support to subordinates' evaluation of their supervisors' behaviour. This finding also has implication for the interpretation of the finding from the supervisor questionnaire as it suggests that the sample may be biased.

PREDICTING WORKER BEHAVIOUR

One of the ultimate objectives of this study was to identify the factors that influence offshore workers' level of safety. Accident involvement has been shown to be linked to offshore workers' self report levels of safety behaviour (Rundmo, 1995, Mearns et al, 1997). It is

therefore important to identify the factors that influence workers' self report safety behaviour. A step wise regression analysis was carried out on the subordinate data set to identify the safety climate factors and the items from the supervisor safety management behaviour scale that influence respondents' self report risk taking behaviour. The results of this analysis are presented in figure 3. The analysis reveals that three safety climate factors and three supervisor safety leadership behaviour statements explain 48% of the variance in subordinate risk taking behaviour.

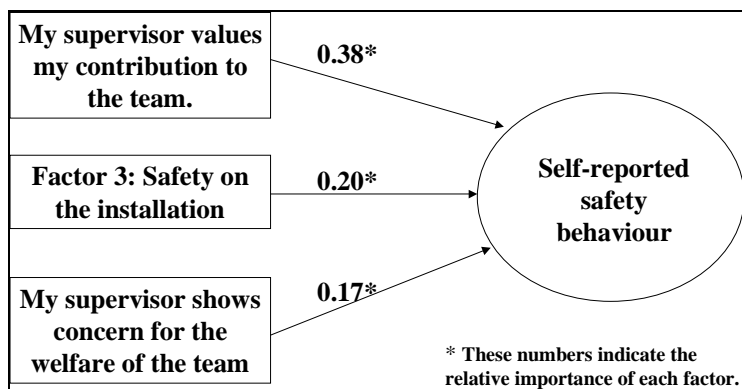
Figure 3: Regression analysis identifying the factors that influence subordinates self report 'risk taking behaviour'



The analysis revealed that three supervisor safety management behaviours influence subordinate risk taking behaviour. In fact, the most important variable in the equation was subordinates' perception of the amount their supervisor encouraged safe working by setting a good example. The two other supervisor behaviours were attending pre-job safety meetings and toolbox talks and the perception that the supervisor has difficulty in motivating the team to work safely. Three safety climate factors were found to influence subordinates self report risk taking behaviour these were 'Reluctance to speak up about safety, followed by Cost versus safety and Perceived lack of commitment to safety.

A further step wise regression analysis was carried out on the subordinate data set to identify the safety climate factors and the items from the supervisor safety management behaviour scale which influences respondents' self report safety behaviour. The results of this analysis are presented in figure 4. The analysis reveals that 19% of the variance in subordinate self-report safety behaviour is explained by one safety climate factors and two supervisor safety management behaviour statements.

Figure 4 Regression analysis identifying the factors that influence subordinates self-report 'safety behaviour'



The analysis revealed that two supervisor safety management behaviours influence subordinate safety behaviour. In fact the most important variable in the equation was subordinates' perception of the amount their supervisor values their contribution to the team. The other supervisory behaviour in the model, was 'showing concern for the welfare of the team'. Factor 3 from the safety climate scale 'Safety on the installation' is the second variable in the equation.

DISCUSSION

The results from the questionnaires indicate that in general both subordinates and supervisors have a positive perception of the 'climate for safety' on the nine offshore installations included in this study. The overall response rate of 33% was the same as the Mearns et al (1997) safety climate survey, but it was lower than the rate for the previous supervisors' study. This low overall response rate was primarily because only 27% of the subordinate questionnaires distributed were returned.

The safety climate scale used in this study appears to be a reasonably reliable measure, because it produced a similar picture of the conceptual structure of safety climate as that produced by Mearns et al (1997) in their offshore study. This indicates that this particular scale is becoming a robust measure of the safety climate on offshore installations. The analysis indicated that the scale could be further improved by removing some of the items that are measuring aspects of the safety climate that are covered by other items. The use of the safety climate questionnaire by more offshore researchers will facilitate the development of a set of offshore safety climate norm data. This data set could be used to track and monitor any changes in the safety climate offshore.

SUPERVISOR QUESTIONNAIRE

The response rate for the supervisor questionnaire was 65%, which is good for a postal questionnaire. This response rate was similar to that of the previous supervisor study. The vast majority of supervisors indicated that they had a very positive perception of the safety climate on their installation.

They also tended to report, high levels (average item score of 3 where 5 is a maximum score) of "consideration" that were similar to the levels reported by the supervisors in the previous study. There was a greater amount of variance in the amount of "initiating structure" than there was in consideration. Overall, they tended to report similar levels of initiating structure as the supervisors in the previous study.

The supervisors in the present study reported that they had positive attitudes towards managing safety. In addition to this, they indicated that their leadership behaviour was also similar to that of supervisors that were classified as effective in the previous supervisors' study.

SUBORDINATE QUESTIONNAIRE

The results indicated that subordinates in the current study had a more positive perception of safety than respondents did in the Mearns et al (1997) safety climate survey. Their responses tended to be similar or slightly less positive to the subordinates surveyed in the previous supervisor study. Respondents also reported low levels of risk taking behaviour and high levels of proactive safety behaviour. They indicated that in general their supervisor displayed high levels of leadership behaviour. These positive results suggest that the standard of safety on the participating installations is very high.

FACTORS WHICH INFLUENCE WORKER SAFETY

The aim of this study was to investigate if specific safety leadership behaviours carried out by offshore supervisors directly influence their subordinates' safety behaviour. These leadership behaviours were considered within the context of the installation's safety climate. The relative importance of both the supervisors' behaviour and the safety climate were examined. Although supervisors' behaviour was the focus of the study, the purpose of carrying out this research was to identify factors that influence workers' safety. It is therefore important to discuss all the factors that this study revealed influence workers' level of safety.

ACCIDENT VERSUS NON ACCIDENT SUBORDINATES

A common procedure used to generate safety improvement actions is to investigate previous accidents so that common root causes can be identified. This approach assumes that if the root causes of previous accidents can be removed or controlled, future accidents can be avoided. It is therefore logical to compare the responses of accident and non-accident subordinates responses, on the major scales from the questionnaire.

This analysis revealed five significant differences between accident and non-accident personnel. Respondents who had previously been involved in an accident had a higher score on factor I (reluctance to speak up about safety) from the safety climate scale. This indicates that they felt personnel on their installation were reluctant to report accidents. This suggests that if a 'blame culture' is perceived to exist on an offshore installation then personnel may be more likely to be involved in an accident. This perception could promote the feeling that senior management is not truly committed to minimising the risk to personnel, but is only interested in the accident statistics being low. It is therefore important for companies to ensure that there is adequate feedback to the workforce about the steps taken to prevent incidents reoccurring.

The analysis also revealed significant differences between the two groups on two of the items from the safety behaviour scale. This finding supports the argument that self-report safety behaviour is a reasonable measure of the level of safety on an offshore installation. It is also interesting that one statement was positive 'I speak about safety with fellow workers and one was negative 'I break rules due to management pressure. The difference between the two groups on the positive statement is interesting as it could indicate that workers who speak about safety with their colleagues are less likely to be involved in an accident. The second finding which suggests that those who break rules are more likely to be involved in an

accident is less surprising. These differences imply that by encouraging positive safety behaviour and reducing negative behaviour accident rates could be reduced.

The non-accident group also reported that their supervisors visited the worksite and involved them in risk assessments more often than the accident group reported. This suggests that supervisors could increase their subordinates' level of safety by visiting the worksite more frequently and involving their subordinates in safety and accident prevention activities. This finding confirms the findings from the Mearns et al (1997) supervisors study findings and is similar to some of the finding from other supervisor studies such as Simard and Marchand (1997). The more that safety is talked about the better as it keeps it on the agenda and in peoples' minds.

PREDICTORS OF SUBORDINATE RISK TAKING BEHAVIOUR

Previous studies (Mearns et al 1997, Rundmo, 1995) found that self report risk taking behaviour correlates with previous accident involvement. On the basis of these previous studies and the evidence presented above it is suggested that self report risk taking behaviour is a reasonable measure of respondents' level of safety. Statistical analysis was performed in order to identify which measures from the questionnaire explained levels of subordinate safety behaviour. This analysis (stepwise regression) indicated that self report risk taking behaviour was influenced by three of the safety climate factors and three supervisor leadership behaviours. The three safety climate factors in the equation were: factor 1 'reluctance to speak up about safety' factor 5 'cost versus safety' and factor 2 'perceived lack of commitment to safety'. This indicates that if respondents perceived that there is a 'blame culture' and that safety is of less importance then they tend to report more risk taking behaviour. It therefore could be argued that risk taking behaviour could be reduced by convincing workers that safety is important and addressing any perception of the existence of a culture of recrimination or a 'blame culture'. Companies should endeavour to ensure that all employees are aware of that it is their personal safety that is important and the accident statistics.

The first variable in the equation was one of the supervisor safety leadership behaviours: 'My supervisor encourages safe working by setting a good example'. The other two supervisor leadership behaviours in the equation were: 'My supervisor attends pre job safety meetings' and 'My supervisor has difficulty motivating his subordinates to work safely'. This suggests that the level of subordinate risk taking behaviour can be reduced by supervisors encouraging and motivating subordinates to work safely and by demonstrating that safety is important to them by attending pre job safety meetings. This finding identifies a number of specific actions that are likely to reduce the level of risk taking behaviour and improve safety. Having said this it is important to be aware that this finding is based on the respondents' perceptions of their supervisors behaviour. It therefore will not be enough just to get the supervisor to change their behaviour, their subordinates will need to recognise the change and believe it to be genuine. It may be difficult for the work group to accept a sudden change in their supervisor's behaviour, therefore a more holistic approach to work group attitudes, beliefs and behaviours may be more fruitful. The most appropriate and effective approach is likely to be company or installation specific.

PREDICTORS OF SUBORDINATE SAFETY BEHAVIOUR

The second regression analysis revealed three variables, which influence respondents self report safety behaviour. This regression equation only explained 19% of the variance in self

report safety behaviour compared with the 48% which was explained of risk taking behaviour. The three variables in the equation were: 'My supervisor values my contribution', factor 3 'Safety on the installation' and 'My supervisor values my contribution to the team'. If an individual feels that safety is perceived to be important on an installation, they are more likely to perform positive safety behaviours.

The two supervisor leadership behaviours that are in this equation are of interest. The items appear to relate to the interpersonal relationship between the supervisor and their subordinates and are not specifically safety related. This suggests that safety behaviour is not only influenced by supervisors' safety attitudes and behaviours but is also influenced by their relationship with their subordinates. It is therefore important for supervisors to create and maintain a positive relationship with their subordinates. While the supervisor's actions and beliefs are crucial to creating this environment, their subordinates have also to fulfil their part of the dynamic. It may be as difficult for them to change their perceptions of their supervisor, as it is for the supervisor to change his/ her behaviour.

EFFECTIVE SUPERVISOR MANAGEMENT BEHAVIOURS

This study has identified seven supervisor safety leadership behaviours that are related to subordinates self report level of safety. These seven behaviour statements were designed to measure four of the factors that Mearns et al (1997) found were associated with effective supervisors. This suggests that at least four of factors identified in the previous study do influence subordinates' level of safety. These four factors include, valuing subordinates, visiting the worksite frequently, work group participation and safety communication. The seven behaviours are classified under the four factors that they are intended to measure in Table 1.

Table 1: Supervisor behaviour that were found to be related to subordinate safety behaviour

Supervisor leadership statements	Relationship with subordinates' safety
<i>Valuing subordinates</i>	
Supervisor make it clear to each of my subordinates that I value their contribution to the team	Subordinates that indicated that their supervisor valued their contribution also reported higher levels of safety behaviour
Supervisor show concern for team members' welfare	Subordinates that indicated that their supervisor showed concern for their welfare also reported higher levels of safety behaviour
<i>Frequency of visiting worksite</i>	
Supervisor visit the worksite three or more times a shift	Non accident subordinates report that their supervisor visits the worksite more frequently than subordinates that have had an accident
<i>Work group participation</i>	
Supervisor involve workgroup members in risk assessments	Non accident subordinates report that their supervisor involves them in risk assessments more often than subordinates that have had an accident
<i>Communicating the importance of safety</i>	
Supervisor attend pre-job safety meetings and tool box talks	Subordinates that indicated that their supervisor frequently attended pre-job safety meeting also reported less risk taking behaviour
Supervisor have difficulty motivating subordinates to work safety	Subordinates that indicated that their supervisor did not have difficulty motivating them to work safely also reported less risk taking behaviour
Supervisor encourage safe working by setting a good example	Subordinates that indicated that their supervisor encouraged safe working also reported less risk taking behaviour

The above suggests that workgroup safety can be maximised by supervisors valuing their subordinates, involving them in decision making, visiting the worksite frequently and communicating their personal positive attitude to safety. This supports the conclusions of the Mearns et al study (1997).

A limitation of the above findings is that they are solely based on subordinate reports of supervisor behaviour and their accident and safety behaviour. There are a number of difficulties with findings based on self-report questionnaire studies. It could be argued that subordinates' evaluation of supervisory behaviour is biased or inaccurate. It is possible that it is subordinates own negative attitude to safety that causes them to report more risk taking behaviour and to indicate that their supervisor does not manage safety effectively. While it is difficult to reject this possibility there are a number of indicators that suggest that this is not the case.

Firstly, the relationship between the leadership behaviours and the safety indicators appeared to be very specific. For example, accident involvement was related to the supervisor visiting the worksite frequently and involving them in decision making. In addition, positive interpersonal relationships and not other factors influenced subordinate safety behaviour.

Secondly, the differences between the responses of subordinates that had supervisors who returned the questionnaire and those that did not, indicate that their evaluation of supervisor behaviour appears to be valid. The comparison between the two groups revealed that subordinates whose supervisors did not return their questionnaire reported that their supervisor; attended pre-job meeting less frequently, was less inclined to accept responsibility for their safety and was less likely to ensure that they understood their PTWs. In addition to this they had a lower score on factor four from the safety climate scale which indicates that they were less convinced of their supervisors commitment to safety. This finding suggests that subordinates are aware of their supervisors' commitment to safety. The variables that were significantly different between the two groups were specific and discerning. This suggests that subordinates evaluations of supervisor behaviour may be a valid measure of their actual behaviour and attitude to safety. This allows more confidence that the supervisor behaviours outlined above do influence their subordinates' level of safety.

CONCLUSIONS AND RECOMMENDATIONS

This study has provided further evidence of the importance of the supervisor in the management of safety. Four aspects of supervisor safety management were found to be important. These were: valuing subordinates; visiting the worksite frequently; a participative style of management and effective safety communication. It is suggested that the subordinates of supervisors who display these behaviours most frequently are less likely to be involved in an accident.

Although this study has identified a limited number of behaviours associated with effective safety management, this should not be interpreted as evidence that these behaviours are sufficient to manage safety effectively. These four aspects of safety management are additional to all the other safety critical tasks performed by supervisors. They are the factors that distinguish good supervisors from excellent ones.

Different factors appear to drive safe behaviour (i.e. encouraging fellow workers to work safely) than drive risk taking behaviour (taking short cuts). Positive safety behaviour can be encouraged by increasing the status of safety on the installation and by supervisors creating a supportive environment. Risk taking behaviour can be reduced by creating a learning culture on the installation and by supervisors communicating the importance of safety, setting a positive example and visiting the worksite frequently.

The findings from this study have implications for the development of supervisor training programs. It is suggested that the interpersonal aspects of supervisor safety management need to be addressed. Training programs should be practical as opposed to knowledge based and focus on the development of positive relationships with subordinates.

It is also suggested that any program to improve supervisors' management of safety should take a holistic approach and include the workgroup in the process. It is important to recognise that there is a two-way relationship between supervisors and their subordinates. This relationship is likely to influence the supervisor's ability to change their safety leadership behaviour. In addition, for any change in their behaviours to be effective then subordinates will have to perceive the change.

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