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RESEARCH NOTE

Participatory analysis of accidents and incidents as a tool for increasing safety behaviour in fishermen. A pilot intervention study

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Abstract
Although occupational accidents are common in fishery, safety work is often not given priority by the fishermen. The aims of this study were to test a group-based intervention for increased activity in safety work through group discussion of accident/incident experience; to study occurred incidents/accidents and how such events were managed; and to study intervention effects on activity in safety work, risk acceptance and perceived manageability of risks. A sample of men from five crews (11 men) of Swedish fishermen participated. The study had a one group pre-test–post-test design for questionnaire data. The emphasis was on qualitative information collected during the intervention and interviews. The results indicated that accident causes could be appraised as being unmanageable even when technical solutions were possible. Psychological factors may cause incidents not to be documented or discussed. Incident experience seldom leads to preventive measures. Interaction between structural, social and psychological factors seemed to explain this. Questionnaires, observations and interview data suggested that some increase in safety work took place during the intervention. After the discussions the participants perceived risks to be less manageable. The study indicated that, although sensitive to dropout, participative safety interventions in fishery are feasible and may be effective. A longer or more intensive intervention may be necessary in order to progress from problem orientation to action orientation.

Keywords: Fishermen, accidents, safety, workplace interventions, participation, group work, perceived risk

Introduction
Although occupational accidents are common in fishery (Törner, Karlsson, Saethre, & Kadefors, 1995; Törner & Nordling, 2000), safety work is often not given priority by the fishermen (Hughes, 1994; Petrusdottir, Hannibalsson, & Turner, 2001). Economical limitations may in part explain this (Törner, Cagner, Nilsson, & Nordling, 2000) but...
psychological and social predictors of safety behaviour, such as safety climate (Flin, Mearns, O’Connor, & Bryden, 2000) norms and culture (Pollnac & Poggie, 1989), personality, stress and cognitive factors (Lawton & Parker, 1998; Murray, Fitzpatrick, & O’Connell, 1997; Wuebker, 1986) have also been studied. The relative importance of these predictors seems to be beyond present knowledge. A study among Swedish fishermen (Eklöf & Törner, 2002) found perceived manageability of risks but not accident experience, perceived personal risk, risk acceptance or fatalism to be (positively) associated with activity in safety work. The results suggested that safety work might benefit from efforts to develop fishermen’s understanding of safety problems and factors that facilitate or hinder activity in safety work.

Our own experience from normative interventions among fishermen is that solutions presented by experts have little chance of being accepted. Problems of expert consultation have also been discussed in the literature (Blake & Mouton, 1989). In other fields of work, such problems have been addressed through participative approaches (Hagberg et al., 1995; Kompier et al., 1998). Problem solving in groups is a common participative technique. Consultative intervention techniques in group settings have been discussed by, for example, Schein (1987). The intervention reported in this paper built on participation and focused on social (creating arenas for discussion of safety management), cognitive (analysis of incidents and assumptions about their causes and manageability) and behavioural aspects (systematic incident documentation and specific action plans for safety).

The aims of the intervention study were:

1. To create participative arenas where different crews could exchange experience and in which safety issues were discussed seriously and thoroughly.
2. To implement a structured way of documenting and analysing incidents/accidents.
3. To study occurred incidents/accidents and their causes.
4. To study how participants managed incidents/accidents and their causes.
5. To study the effects of intervention on perceived manageability of risks, risk acceptance and activity in safety work among participants.

Method

Study design

As a quasi-experiment, the study had a one group pre-test–post-test design. Each participant was his own control. The emphasis was on collecting qualitative information, however.

Intervention design

This section will describe the intervention design. After an introductory seminar at which general discussions about safety in fishery were held and results from a safety-oriented study among fishermen (Eklöf & Törner, 2002) were presented, the participating crews were divided into two groups with initially representatives from three crews in each (6–8 persons), according to home harbour. The following agreements were made between researchers and participants: (1) experiences and reflections among participants should be the major working material at group meetings; (2) participants were responsible for providing such material; (3) incident diaries should be used regularly; (4) an incident should be defined as an event that could have resulted in personal injury, had the
circumstances not prevented this; and (5) all crews should make up a specific safety action plan at the end of the intervention period.

Over a 10-month period each group met six times, with each meeting lasting for 1.5 to 2 hours. The meetings were led by the authors (a psychologist and an ergonomist well acquainted with fishery and its vocabulary). Their role was to facilitate expression of experience and reflection by posing questions and to make sure each event was worked through (see below). The first strategy built on ideas about process consultation (Schein, 1987) and focused on how participants worked on their task (analysis of incidents, analysis of how incidents and hazards were and could be managed and actual behaviour in pursuit of risk reduction), not general social processes in the group or individual characteristics (in order to minimize anxiety and defensive processes). The second strategy was to avoid giving expert advice except in instances where such advice was explicitly asked for in connection with some specific problem under discussion. An occupational health and safety engineer took part in order to make technological support directly available.

Between meetings, all incidents during work were to be noted in a diary kept aboard. All incidents noted or remembered were analysed and discussed during the group meetings. The discussion leaders made sure that the following aspects were worked through for each event: (1) description of event; (2) identification of basic factors (the basic cause of the accident, e.g. equipment not securely fixed) and releasing factors (conditions that made it easier for the basic cause to act, e.g. rough seas, that made the loose equipment move about); (3) classification of causal factors as technological, organizational or individual; (4) discussion of how the event and its consequences were coped with; and (5) for each causal factor: discussion of preventive measures.

Participants

Nine active crews from the Swedish west-coast were contacted, three crews refused to participate due to lack of time or interest, and one crew quit fishery following the introductory seminar. Eleven persons representing five crews participated at group meetings. All were male trawl fishermen aged from 17 to 55 years. Seven persons provided baseline questionnaire data, of which six provided follow-up data (the seventh could not be reached). Follow-up interviews reached 10 crew members (the eleventh could not be reached). In interviews, seven individuals reported that genuine safety interest motivated participation, while three reported to have ‘followed along’.

The modest sample size was mainly due to the fact that the study was of a pilot character that implied limited resources. Another reason was the practical difficulties in recruiting fishermen to this relatively time-consuming intervention. This in turn had to do with the fact that no tradition of participatory safety work of this kind existed in Swedish fishery.

Measures and data collection

Baseline questionnaire data were collected at the introductory seminar, before any study results were presented. Follow-up questionnaire data were collected by the authors immediately after the final group meeting. The questionnaire contained measures of perceived manageability of risks (an index based on ratings of the degree to which risks associated with 10 specific working situations were believed by the respondent to be manageable by improved working methods or technology), risk acceptance (five items about the respondent’s readiness to accept risks at work) and self-reported activity in safety
work (four items on individual and collective activity for improved safety). The measures are specified in a previous publication (Eklof and Toerner, 2002).

Follow-up interviews by telephone 2 months after the intervention period covered motives for participation, opinions about the intervention design and process, the existence and content of safety action plans and effects attributed to participation. A researcher not further involved in this project, and with whom the participants had had no previous contact, performed the interviews.

During each meeting (including visits on board ships, where arrangements that had played a role in incidents/accidents could be observed) the group leaders took notes on: (1) behaviour that expressed cognitions, attitudes and emotions in relation to safety issues or the intervention itself; (2) descriptions of how incidents and identified hazards were managed behaviourally; (3) intensity of communication, distribution of activity during meetings and inter-crew interaction; (4) adherence to agreements concerning participant roles (as specified in the section on intervention design); and (5) reporting of incidents/accidents. These data will be referred to as ‘notes from group meetings’.

The intervention and data collection period was 1998–1999.

**Data analysis**

Interview responses and notes from group meetings were classified according to which study aim(s) they were relevant to. Incident/accident data were classified using the format described in the intervention design section. For the observations (except incident/accident data and attendance) only the qualitative dimension was considered. For interview data quantitative information was also considered.

Changes in perceived manageability of risks, risk acceptance and activity in safety work were defined as the difference between pre- and post-intervention measurements.

There were three categories of data source, which will be indicated in the results section. The categories were: follow-up interviews conducted 2 months after the intervention period; notes made by the researchers during the group meetings; questionnaire data obtained before and immediately after the intervention period.

**Results**

**Arenas for discussion and exchange of experience**

**Notes from group meetings**: One of the two groups initially had eight members. Of these, one never attended, two attended three times. This meant that at least five participants were present at the meetings. The other group initially had six members. Two individuals (one crew) never attended because they had quit fishery, two attended once and one attended three times. In the latter group attendance was so small and irregular (most meetings were held with just two participants) that an effective inter-crew interaction could not be achieved. In the former group, attendance was more regular and interaction was more frequent between as well as within crews.

Initially, the knowledge about fishery among the group leaders was ‘tested’ by group members. After ‘approval’, the group leaders were accepted as such and their interventions met no visible resistance. Both groups reported and discussed incidents/accidents according to the intended structure, guided by questions from the group leaders. Participants expressed frustration and embarrassment over how they managed safety. Such openness seemed to inspire other members to participate with their own feelings and thoughts on the
matter. This kind of process seemed to create an air of increased motivation towards activity in safety work. During one meeting a junior crewmember claimed that unsafe practices were maintained because the skipper had a conservative attitude towards alterations in working practice. To assert that such practices were unsafe might be associated with the risk of being perceived as challenging the entire role and authority of the skipper. In the discussion, instead of encouraging such risk-taking, the group leaders posed questions intended to get the focus back on the specific incidents and possible specific preventive behaviours. This was a way of protecting and reinforcing the existing working alliance between crew members, instead of putting it to risk by allowing processes that may have led to ‘loss of face’ and subsequent manoeuvres to ‘save face’. At times the discussion tended to deal with factors beyond the scope of the project, e.g. fish prices and fishery politics. These discussions presented an opportunity to air feelings of frustration and powerlessness. In these situations the strategy from the discussion leaders was to avoid lingering on issues beyond the scope of the project, by asking questions to get the focus back on potentially manageable things. Such diversions from occupational safety issues took up little of the time and were not a problem.

Follow-up interviews: All respondents appreciated the opportunity to exchange ideas and experience with other crews. Several wished that more fishermen with long experience had participated. All respondents stated that in the group sessions they had felt free to express observations and thoughts. Some thought that the activity among some of the fishermen during the discussions had been too low. On the other hand, it was noted that: ‘fishermen are not that used to talking much’.

Six of the respondents approved of the number and frequency of the meetings (six meetings in 10 months), while two felt that the meetings were too many and too frequent. All respondents considered the duration of the group meetings to have been adequate. All respondents were interested in continuing the meetings in the discussion groups after the intervention in co-operation with the OHS services.

Structured documentation and analysis of incidents/accidents

Notes from group meetings: Several incidents had not been noted in the diaries but were remembered during meetings.

Follow-up interviews and notes from group meetings: Diaries tended to be kept on the bridge and were thus not immediately available when events occurred. Often the skipper or an especially interested crew member was perceived as responsible for diary keeping and the extent to which it was used depended upon the activity of this person.

Follow-up interviews: The diaries had been used at some time by five of the participants and four of these intended to keep using them after the project. Eight respondents considered diaries to be a good idea (incidents got documented, documentation was made available to other crew members, overview over incident types and frequency was facilitated) while the remaining two felt that the diaries were unnecessary – ‘important events are remembered anyway’.

Notes from group meetings: At all meetings except one, incidents/accidents were reported and analysed. Several serious incidents were reported during group meetings, but were so common that they were not seen as incidents but as normal events, and therefore not noted in the diary. In particular, slips and falls belonged to this category. The participants gave the
impression of being well aware of the chain of events leading up to an incident. The distinction between basic and releasing factors was not always clear to the participants, however. Potential releasing factors that were impossible to avoid, such as weather or the presence of slippery matter on deck, could be seen as basic causes. This could lead to the false conclusion that prevention was impossible.

Technical expert support

Notes from group meetings: Support from the OHS engineers was requested and provided. This concerned means to increase friction between feet and ship (more suitable boots and a way of covering slippery surfaces with high friction matter), hearing protectors with built-in radio communication facility and improved trawl board fixations. All requests grew out of previous analysis of incidents. In order to be accepted, proposed solutions had to be robust and practical rather than technologically sophisticated but with unproven reliability.

Follow-up interviews: More information on possible sources of economic support for safety improvements and information on how to go about applying for such funding was requested by respondents.

Incidents/accidents and their causes

Notes from group meetings: Incidents/accidents where crew members were squashed or hit were most common (Table I). Heavy parts of equipment (trawl, otter board, hook, block, engine, piles of fish boxes) that went out of control, or broken wires were the causes of these. Slips and falls, caused by fish, oil or other slippery matter on deck, by a combination of smooth walking/standing surface and footwear unsuitable for such surfaces, by a poorly fixed chair on the bridge or by failure to notice an open lid, were also common (Table I).

Weather, ship motions, stream conditions and their interactions were the most common releasing factors behind incidents/accidents. Deficient work methods, manifested by confusion or inadequate behaviour, as well as poor equipment function due to neglected maintenance were also relatively common (Table II).

Technological imperfections (events that could have been avoided with better technology) were the most common basic causes of incidents/accidents, but conscious risk-taking, lack of good routines and poor maintenance of equipment were also identified as frequent causes (Table II).

Management of incidents/accidents and their causes

Notes from group meetings: The following quote illustrates a common observation during group meetings: ‘While it is happening you are totally focused on sorting out the situation.

<table>
<thead>
<tr>
<th>Type of Accident/Incident</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crew member got squashed or hit</td>
<td>24</td>
</tr>
<tr>
<td>Slips or falls</td>
<td>15</td>
</tr>
<tr>
<td>Ship leaking</td>
<td>2</td>
</tr>
<tr>
<td>Ship unmanageable</td>
<td>1</td>
</tr>
<tr>
<td>Physical overload on crew member</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
</tr>
</tbody>
</table>
Afterwards you joke harshly about it to keep fear at a distance. A striking observation was
that crews repeatedly experienced the same type of incident without taking any preventive
measures. It happened that participants expressed frustration over the tension between
being aware of risks and the economically necessary focus on productivity. Frustration and
embarrassment were also expressed over the fact that safety measures well-known to be
necessary often were not implemented, even after repeated discussions in the groups.
Suggested explanations for this were: Lack of time (‘to-do-lists’ were written but only the
most urgent matters got seen to, families also demanded time), difficulty in finding a
practical solution and lack of authority in the crew (difficult to influence decisions if you are
not a skipper; some skippers are conservative regarding working methods and/or
investments in safety).

Follow-up interviews: It was a general opinion that money severely restrained the possibility
for safety improvements.

Notes from group meetings: Participants were aware that not being well acquainted with
routines or setting aside routines may lead to vastly enhanced risks, since safety depends on
everyone doing things in the way they are expected to and knowing where the hazards are.
This was often a problem after some time of absence from work and due to new
crewmembers. A common way to handle these problems was to ‘take it a bit easy’ for some
time until everybody felt ‘run in’. For some work operations that were known to be risky no
set routines were reported to exist or considered possible.

Safety action plans

Follow-up interviews: At follow-up interviews, no plans for future improvements in safety
were reported to exist.

Notes from group meetings: The most clearly defined plan entailed testing and evaluation on
three of the participating vessels of a type of slip resistance that previously had not been
used in fishery. Less slippery boots were also tested. However, one crew had just bought a
new ship with improved safety and one crew was about to buy a new ship and was not motivated to take measures on the present one.

Activity in safety work

Questionnaire: When questionnaire data at baseline were compared with responses immediately after the final meeting, four respondents reported increased and one reported decreased activity in safety work \((N=6)\).

Follow-up interviews: All but one of the respondents attributed increased general interest in safety, more interest in searching for hazards and a higher degree of participation in safety work on board to participation in the project. Four of the respondents reported that they had become more aware of the consequences of accidents because safety at work was now more often reflected upon and discussed.

Notes from group meetings: During the final group meetings, participants stated that they thought and discussed more about safety, followed routines more carefully and were more active in fixing safety-related problems on board. These changes were attributed to participation in the project.

Perceived manageability of risks and risk acceptance

Questionnaire: When questionnaire data at baseline were compared with responses immediately after the final meeting, one respondent reported increased and five reported decreased perceived manageability of risks \((N=6)\). Four respondents reported decreased and two reported increased risk acceptance.

Discussion

The authors believe that the qualitative information about incidents/accidents obtained in this study was valid. As for the quantity of events, our impression is that all accidents were reported but that many incidents were not. Embarrassment, self-blame and a tendency to regard common incidents as normal may explain the tendency to under-report incidents.

There were major limitations to this study. These included the small sample and limited validity due to possible selection bias, the fact that information was possibly biased in favour of intervention effects, and lack of controls. The intervention design proved to be sensitive to dropout but was effective with respect to achieving a serious discussion on safety issues. The structured analysis of incidents/accidents worked smoothly and facilitated verbalization of experience, experience exchange and documentation. The authors feel that the focus on specific, identified problems made discussion on the distribution of authority, norms and a definition of acceptable safety level motivated and natural among crew members. The distinction between basic cause and releasing factor was not always clear to the participants and we think the group discussions played a role in making this clearer. A major effect of structured incident reporting was to put problems of incident identification and memorizing in focus. Diaries proved to be unreliable in this respect, but may still have a practical value. Slip incidents occurred repeatedly but were normally not noted in diaries or reported spontaneously at group meetings. A previous (more representative) study of accidents in fishery also found falls and slips to be common (Törner and Nordling, 2000). This suggests that some of the most prevalent hazards are ignored.
The results indicate a large potential for prevention through technical, but also organizational, measures. In order to be accepted, solutions should be robust and practical.

The emotional experience of incidents seemed to linger and express itself in terms of frustration and embarrassment. It seemed that incident experience did not motivate direct action to solve the problems that lay behind incidents. A similar result was found in another study in Swedish fishery (Eklöf & Törner, 2002). Interaction between structural, social and psychological factors seemed to explain why incident experience seldom lead to preventive measures, so this should be given priority in further safety intervention work.

The results suggested that following the intervention there was increased activity in safety work and decreased perceived manageability of risks. However, due to the small sample it is not possible to draw any confident quantitative conclusions. The observed effects may be a reflection that the group discussions made safety problems more explicit and dealt with difficulties associated with preventive work. A longer or more intensive intervention may be necessary in order to progress from problem orientation to action orientation. The authors believe, however, that the intervention was effective in stimulating activity in safety work and that it initiated some specific measures. The study indicated that, although sensitive to dropout, participative, talk-based safety interventions in fishery are feasible and may be effective.

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