A Poster Campaign for Improving Safety on Shipyard Scaffolds

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In a constantly changing work environment, hazards for occupational accidents are created easily. In these circumstances, more demands are made on the workers' ability to identify and to control the hazards. The objective of this study is to determine whether hazard consciousness among workers can be enhanced by a poster campaign. Attention was also paid to the role of the poster campaign in improving safety. The campaign was conducted in the shipbuilding industry and was directed primarily to workers who were exposed to risks associated with the use of scaffolds. Local conditions of the shipyard under study were taken into account in creating the campaign material. After the campaign the workers were more conscious of hazards associated with the use of scaffolds, and the number of occupational accidents was reduced in the intervention area. Improving safety at a workplace is a continual process affected by numerous factors. A poster campaign is one such action contributing to this process.

An accident is a complex phenomenon resulting from the hazards of a system. Hazards derive from the characteristics of people, hardware (including all aspects of the plant, the workplace, substances, machinery, and other equipment), and their interaction. Three main strategies have been presented for hazard control: the source of hazard can be removed (elimination); the probability of accident can be reduced (containment); or the seriousness of the consequences can be reduced (mitigation) (Dawson, Poynter, & Stevens, 1982).

It is of primary importance in accident prevention that people identify hazards. Predictions of what may happen and what can go wrong are made on the basis of intellectual models of cause-effect sequences. In practice, people may carry out a behavior pattern a number of times without any negative feedback. The successful, but unsafe, behavior will be established as normal work routine. People tend to start ignoring hazards that are familiar to them. In such circumstances, enhancing hazard consciousness is essential for stimulating the safe work
practices (DeJoy, 1985; Denton, 1982; Hale & Glendon, 1987; Petersen, 1984).

Safety campaigns are widely used in industry. In accident prevention they represent a containment strategy aimed at reducing the probability of accidents. Because such campaigns focus on people, they are directed at cognitive processes through information and possibly also at motivation. Campaigns are expected to lead to changes in behavior and, thus, to improved safety. In practice, however, changes are not always produced. In order for a campaign to be effective, it should fulfill certain demands. These include a clear objective and a message focused on specific aspects of behavior. The message has to be relevant to the environment for which it is intended (Hale & Glenon, 1987).

One successful poster campaign was conducted in seven steel works. A single operation, the hooking back of chain slings on to a crane hook when not in use, was selected as the objective for the campaign. Three types of posters with the same text, “Hook that sling,” were used in the campaign. As a consequence, the target behavior increased by about ten percent. However, the study did not provide answers concerning the detailed mechanism of poster effectiveness (Laner & Sell, 1960).

In another study aimed at preventing children’s household accidents, the best results were achieved in the group of families who, in addition to being exposed to the general message of television programs, received a home visit. Sixty percent of the families in this group undertook preventive actions, whereas the corresponding figure in the other, not visited group was 9% (Colver, Hutchinson, & Judson, 1982).

The present study was conducted to increase understanding of the role of the poster campaign in improving safety. Special attention was paid to the effectiveness of the poster campaign in enhancing the hazard consciousness of the workers. The aim was also to gather information that could be used in conducting poster campaigns in industrial companies.

The campaign was conducted in the ship-building industry, and increasing safety in the use of scaffolds was selected as an objec-

MATERIAL AND METHODS

Subjects and Setting

The shipyard participating in the study is located in Helsinki, Finland. In 1984 it employed approximately 2,800 persons. Large cruiser-liners, icebreakers, and other ship types are constructed at the shipyard. The study was carried out in cooperation with the safety department of the shipyard.

An area comprising three departments where numerous people are exposed to risks associated with the use of scaffolds was selected for the intervention. About 300 persons work in these departments. One of the departments was responsible for ship section fabrication, and this part of the construction process was done outdoors. The work in the other two departments took place in production halls: the ship sections were painted in a painting hall, and the sections were joined together in a dry-dock.

Hazards are created easily in the shipyard’s rapidly changing environment. The basic safety level of scaffolds is created during their installation. At this particular shipyard a group especially trained for installing the scaffolds was responsible for this task. However, the study concentrated mainly on the scaffold users who determine the final safety at worksites. The various objects left on working platforms, runways, and stairs can fall down and injure the people working below. Stumbling and falls occur on blocked runways. Ladders, instead of
proper scaffolds, are used as quick solutions to get the work done, and the ladders may not even be prevented from sliding. All sorts of temporary changes may be made to scaffolds afterwards. Parts of railings may be removed to allow the transporting of large materials to ship sections and may not be put back. The controlling of hazards is impossible without the active participation of workers.

Some features of an action research approach, combining research and practice, were adopted in this study (Argyris, Putnam, McLain-Smith, 1985; French & Bell, 1973). Data on risks associated with the use of scaffolds were collected. This information was utilized in the production of the campaign material. The process and the outcome of the campaign were evaluated by the researcher.

Campaign Material

In the beginning of the study, preliminary information was gathered for the purpose of developing the campaign material. Historical data on occupational accidents associated with working on scaffolds were obtained from two sources: the register of serious accidents compiled by the National Board of Labor Protection of Finland, and the shipyard’s own accident reports.

The register of serious accidents was reviewed during the years 1977–1983. One third of the accidents that had occurred at Finnish shipyards during that time were associated with scaffolds (15 cases in all). The shipyard’s own accident reports were reviewed for the 2-year period before the intervention (July 1, 1981 through June 30, 1983; n = 220). The accident reports also provided material for the evaluation of the intervention effect (described later in more detail).

The preliminary survey included the investigation of the prevailing situation in the three target departments. A safety analysis approach was utilized in the investigation. Safety analysis aims to identify the hazards and potential accidents of a system (Johnson, 1980; Saarelä, 1983; Suokas, 1988). Rules and standards were reviewed to investigate the technical requirements for the shipyard scaffolds and recommendations for safe work practices.

Observations were conducted in the target area to identify hazards associated with the use of scaffolds. Free discussions provided information on the supervisors’ opinions about scaffold safety. A structured interview was used to find out the workers’ views about hazards and problems associated with the use of scaffolds. The structured interviews also provided material for the evaluation of the intervention (described later in more detail). Photographs were taken to help document the identified hazards.

The campaign material was developed in collaboration with the safety department of the shipyard, the Institute of Occupational Health, and the Centre for Industrial Safety, which employed a free-lance artist to assist in the preparation of visual material. The campaign material consisted of a printed poster and a circular. The poster (70 × 100 cm in size) focused on preventing objects or people from falling (Figure 1). The circular contained more detailed information on the nature of hazards associated with the use of scaffolds and descriptions of possible accidents. Special attention was given to accident prevention. For example the following activities necessary for controlling hazards were emphasized:

1. The scaffolds must always be checked before use: they must be steady, platforms must be secured, access to platforms must be safe, falling must be prevented with railings.

2. The need for scaffolds must be anticipated, and enough time has to be reserved for installing scaffolds.

3. Workers without special training are not allowed to install scaffolds or make changes to them.

4. Ladders must be prevented from sliding.

5. Unnecessary tools and other objects must be removed from scaffolds as soon as possible to prevent them from falling and injuring those working below.

6. The foreman has to be notified of hazards that cannot be eliminated by the worker.

The campaign was started with a training
A seminar which was conducted in the beginning of September 1984. Department managers, first-line supervisors, and workers' safety representatives from the target departments were invited to the seminar. Nearly all of those invited attended the seminar, altogether about 10% of the total personnel of the departments.

The seminar offered detailed information about hazards with scaffolds. Slides illustrated the real hazard situations of the attendees' own work environment. Possibilities for controlling hazards were discussed. The circulars were given to the participants for distribution in their own working areas. They were also encouraged to discuss scaffold safety with other persons in their department not present at the seminar. The posters were hung up in the intervention area at suitable spots. In addition to being distributed to individual workers, the contents of the circular were printed in the shipyard's own newsletter.

**Evaluation Methods**

A structured interview was used to evaluate the effect of the campaign on hazard awareness among the workers. The interviews were carried out at worksites in the three study departments. The persons to be interviewed were selected randomly by the researcher to cover as well as possible the whole intervention area and the various tasks carried out there. The aim was to interview every third worker seen by the researcher. The interviews were carried out anonymously.

Altogether, 38 workers were interviewed before the campaign. The interviews were repeated later in the fall after the posters had been displayed at the shipyard for about 1 month. The persons interviewed after the intervention were also selected randomly. However, those workers who had been interviewed before the campaign were rejected to eliminate the possible learning effect caused by the interview itself. The total number of postcampaign respondents was 38.

The format used in the interviews included the following topics:

1. The workers were asked to describe the hazards associated with scaffolds. Their own experience at the shipyard was referred to concerning scaffolds used as working platforms or runways to worksites. They were asked for their suggestions for preventive measures.

2. The hazards with scaffolds were made more tangible by using four photographs of typical hazard situations at the shipyard. (See Figure 3.) The respondents were asked to list the hazards in each photograph and to say what should be done to control the hazards.

After the campaign, the interviewees were also asked from what source they had gotten information about the campaign topics. The forms were filled in by the researcher.

Observations were also conducted after the campaign to get additional information on the possible improvement of scaffold
safety at worksites. Five observation sessions were carried out by the researcher both before and after the campaign. Each observation session lasted 15 minutes in each department, the total time per observation being approximately 45 minutes. The observer went through certain items according to a list drawn up specifically for each area. The observed objects were scored as either safe, unsafe, or not observed. Free notes concerning the relevant topics were also made during the observation (Rees, 1967).

The work areas of the section fabrication provided the best possibilities for comparisons based on observations. In the hall of the dry-dock there was an almost completed ship, and scaffolds were no longer needed. (The number of scaffolds is also low if the construction process has been started recently.) In the painting hall sometimes there was no ship section during the observation. The number of observed objects related to scaffold safety therefore remained low in these two areas. The results of the observations were summarized both before and after the campaign and delivered to the safety department of the shipyard, to the supervisors of the target departments, and to the supervisor of the team responsible for installing scaffolds.

A before-after analysis was made to get information on the effect of the poster campaign intervention on accidents. The shipyard's own accident reports were used as a data source. The reports are written at the shipyard by the foremen. The material included all the accidents that had occurred in the intervention departments and that had caused at least 3 days' absence from work. (Three days' absence is the criterion of the compulsory workmen's compensation in Finland.) The analyzed periods were July 1, 1981 through June 30, 1983 (P1) and July 1, 1983 through June 30, 1985 (P2).

In the accident analysis special attention was paid to the types and the severity of the accidents. The role of scaffolds in the accidents was not analyzed quantitatively. This information was not included reliably enough in the data source, which had originally been collected for other purposes. However, the accident descriptions could be utilized for developing the campaign material. Information on the accident frequency at the shipyard was obtained from the shipyard's accident statistics.

RESULTS

According to the results of the interviews, the workers were more conscious of the hazards associated with scaffolds after the campaign. To the general question concerning hazards with scaffolds, the respondents gave more specific answers after the campaign. The numbers of hazards mentioned by the interviewees before and after the campaign are summarized in Figure 2. The increase was statistically significant ($t=2.28$, $df=74$, $p<0.05$). On average, each respondent listed 1.7 hazards ($SD=1.0$) before the campaign. After the campaign the corresponding figure was 2.2 ($SD=0.8$).

Also, the number of preventive measures described by the workers increased slightly (Figure 2), but the difference was statistically not significant ($t=1.08$, $df=74$). The description of the hazard (e.g., "a missing railing") often included a clear hint about a preventive measure. It may be assumed that the workers did not always want to repeat the self-evident facts, and this affected their answers to some extent.

The hazards identified in the photographs are shown in Figure 3. After the campaign
the respondents identified more hazards in each picture. The difference was statistically significant with picture no. 3 ($t=2.85$, $df=74$, $p<0.01$).

The campaign material had been noticed relatively well at the shipyard. Everybody had recognized the poster (Table 1). The poster served as the only information source for 26% of the workers. The shipyard’s newsletter was an effective information channel: more people had read about the hazards with scaffolds and the possibilities to control them in the newsletter than in the circular. About every fifth worker had heard his supervisor or the workers’ safety representative talking about the subject.
TABLE 1
REPORTED MEANS OF ACQUIRING INFORMATION ON THE CAMPAIGN CONTENTS

<table>
<thead>
<tr>
<th>Means of Acquiring Information</th>
<th>% of Interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saw the poster</td>
<td>100</td>
</tr>
<tr>
<td>Read the circular</td>
<td>42</td>
</tr>
<tr>
<td>Read the article in the shipyard's newsletter</td>
<td>63</td>
</tr>
<tr>
<td>Heard from supervisor</td>
<td>21</td>
</tr>
<tr>
<td>Heard from workers' safety representative</td>
<td>19</td>
</tr>
</tbody>
</table>

The results of the observations reflected some improvement in scaffold safety. In the work areas of the section fabrication, 48% of all observed objects were considered safe before the campaign. After the campaign the corresponding percentage was 76. Although the work areas of the section fabrication provided the best possibilities for comparisons, the number of observed objects (60 before the campaign and 71 after the campaign) was still relatively low, preventing the drawing of definite conclusions.

The observations also produced detailed information on specific problems and hazards. A steel structure equipped with stairs was used at the shipyard as a runway to ship sections. This type of structure had been developed at this particular shipyard. The height of the structure could be varied depending on the needs of the section under construction. It was an excellent solution, increasing safety compared to less advanced arrangements. However, during the observations before the campaign, a hazard was noted to be associated with these types of structures. The crossing to the ship section was not a firm part of the structure. As a consequence, different kinds of solutions were used in practice. These solutions usually created a falling hazard. After the campaign, all these structures were provided with firm ramps, which ensured safe entrance to the ship sections.

In spite of some progress, the poster campaign seemed to be ineffective in eliminating unsafe work practices. Working at heights without proper scaffolds and climbing along the scaffold structures instead of using stairs were noted also after the campaign. The reasons for unsafe behavior are complex. Unsafe behavior may be passively accepted as a usual work practice in the work organization. The organization should be viewed in the context of its own history. At this particular shipyard, for example, the supplier of the scaffold had emphasized that the advantage of the scaffold type he was selling was that it was easy to climb along.

The supervisor of the team responsible for installing the scaffolds reported that other types of changes occurred at the shipyard. According to him the workers paid more attention to scaffold safety after the campaign. They set higher requirements for the quality of the scaffolds installed for them by the team. This indicates increased awareness of hazards among the workers.

The accident statistics of the shipyard showed a 6% decrease in accident frequency between 1983 and 1984. However, the trend had been decreasing before the study. Table 2 gives the distribution by accident type of the analyzed accidents in the intervention departments. Compared to the situation before the campaign, no change was noted in the types of the accidents: the difference between the two periods was statistically not significant ($x^2=7.3$, $df=6$). The total number of accidents decreased in the intervention departments by 39%. The actual number of hours worked was available for the total shipyard. These figures indicated a 2% increase in hours during Period 2 (P2) compared to Period 1 (P1). The number of hours worked could not be obtained separately for the intervention departments. The severity of injuries, based on lost workdays, remained unchanged compared to the period before the intervention.

DISCUSSION

The campaign seemed to have been effective in enhancing hazard consciousness among the workers. After the campaign the workers could specify more hazards associated with the use of scaffolds. A written
TABLE 2
PERCENTAGE DISTRIBUTION OF TYPES OF ACCIDENTS IN THE INTERVENTION DEPARTMENTS BEFORE (P1) AND AFTER (P2) THE POSTER CAMPAIGN

<table>
<thead>
<tr>
<th>Type of Accident</th>
<th>P1 (n = 220)</th>
<th>P2 (n = 135)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall to lower level</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Fall on same level</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Struck by moving object</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>Struck against object</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Overexertion</td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td>Contact with (high temperature, electricity, etc.)</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Note. Includes cases with at least 3 days' absence from work.


message had reached the workers more effectively than an oral message. The training seminar arranged for the key persons in the beginning of the campaign obviously failed to create a strong involvement in the campaign among the supervisors and workers' safety representatives. On the other hand, the relatively low interaction activity may also be affected by cultural factors.

Although some improvement was noticed in work practices, the campaign effect on this area seemed to be relatively modest. According to other studies, informational safety campaigns are seldom strong enough alone to lead to outstanding improvements in safety (Colver, Hutchinson, & Judson, 1982; Robertson, Kelley, O'Neil, Wixom, Fitwir, & Haddon, 1974; Sell, 1977). In the present study, the accident frequency fell at the shipyard during the intervention. The absolute number of accidents also decreased in the study departments. However, no change was noted in the types of accidents. It is difficult to point out clear connections to the campaign. It does not seem likely that the poster campaign alone could have had a considerable effect on the occupational accidents. For measurement purposes, accidents do not provide a sensitive measure of the changes occurring in the system. For this reason, other techniques have been recommended for safety program evaluation (Rockwell & Bhise, 1980; Tarrants, 1980).

The fact that the workers were already relatively well aware of the hazards associated with scaffolds before the campaign indicates the complexity of the problem. Awareness of hazards cannot alone ensure safety. Before considerable improvement in safety can be expected, more profound changes are needed in the system.

The improvement of scaffold safety in industry is influenced by a wide variety of factors. Safety can be increased through technically advanced scaffold solutions. Safety can also be improved by planning work to minimize working at heights. As many tasks as possible can be planned to be performed on the ground level. Permanent improvement in safety may be achieved if the source of hazard can be removed.

Even if the main emphasis in accident prevention is on elimination of hazards, other means are needed to reduce the probability of accidents. A carefully designed poster campaign is a useful means for enhancing the hazard consciousness of workers. This study, however, does not provide information on how long-lasting this effect is. In the poster campaign arranged at the shipyard the campaign material was tailored to local needs. The campaign had a clear objective, and possibilities for controlling hazards were emphasized in the campaign. The experiences of the present study can be utilized in other industrial companies. The limitations of the poster campaign should nevertheless be taken into account. Other measures are needed to establish changes in work practices. Improving safety at the workplace is a continuing process, and a poster campaign is one action interacting with other actions in this process.
REFERENCES


