

## Accident Prevention in Reindeer Herding Work

ANNELI PEKKARINEN<sup>1</sup>, HANNU ANTTONEN<sup>1</sup> and SIRKKA PRAMILA<sup>1</sup>

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**ABSTRACT.** This study deals with the safety of reindeer herding work. The possibility of developing preventive measures and influencing the reindeer herders' behaviour by providing information were investigated. Since reindeer herders in Finland work as private entrepreneurs (like farmers), safety measures for them are voluntary; hence a great success rate was not expected. The study population consisted of male herders age 16-64 years (N=3324). The reindeer herding districts (N=53) were divided randomly on a geographical basis into three groups: one group received information about accident prevention in eight "theme" letters, another received it from occupational health personnel during medical examinations, while the third received general information from the press. Data on accidents that had occurred were collected in two questionnaires before and after distributing the information. As a result, a total of 34 preventive measures were successfully developed for reindeer herding work. The follow-up questionnaire showed that the herders had implemented an average of 5.8 measures/respondent. The accident rate decreased in two years from 20 to 15 accidents/1000 working days. However, there was no statistical difference between the groups that received information from different sources. In conclusion it can be stated that it is possible to develop preventive measures and to influence the safety behaviour in the reindeer herders' work by disseminating information. The press and journals would be most effective in the dissemination in an occupation like this.

**Key words:** occupational accidents, safety, reindeer herding work, preventive measures, personal protective equipment

**RÉSUMÉ.** Cette étude porte sur la sécurité reliée à l'élevage du renne. On a fait des recherches sur la possibilité de créer des mesures préventives et d'influencer le comportement des éleveurs de rennes en leur procurant de l'information. Vu qu'en Finlande, les éleveurs de rennes travaillent à leur compte (comme les agriculteurs), pour eux, les mesures de sécurité sont volontaires, ce qui explique qu'on ne s'attendait pas à un fort pourcentage de réussite. La population de l'étude consistait en des éleveurs de sexe masculin, âgés de 16 à 64 ans (N = 3324). Les districts d'élevage du renne (N = 53) ont été divisés en trois groupes, choisis au hasard sur une base géographique : l'un d'entre eux a reçu de l'information sur la prévention des accidents par le biais de huit lettres traitant chacune d'un aspect particulier; un autre groupe l'a reçue de membres du personnel de la santé au travail au cours d'examen médicaux, tandis que le troisième groupe a reçu de l'information générale par le biais des journaux. Les données sur les accidents qui ont eu lieu ont été recueillies à l'aide de deux questionnaires distribués avant et après que l'information ait été donnée. Au total, on a réussi à développer 34 mesures de prévention. Le questionnaire de suivi a révélé que les éleveurs avaient appliqué en moyenne 5,8 mesures de sécurité par répondant. En deux ans, le taux d'accidents est passé de 20 à 15 pour 1000 jours de travail. Il n'y a cependant pas eu de différence statistique entre les groupes qui avaient reçu de l'information provenant de sources différentes. On peut dire en conclusion qu'il est possible de mettre sur pied des mesures préventives et d'influencer le comportement relatif à la sécurité dans l'élevage du renne en disséminant de l'information. Dans une occupation professionnelle de ce genre, les journaux et revues seraient le moyen le plus efficace pour assurer cette diffusion.

**Mots clés :** accidents du travail, sécurité, élevage du renne, mesures de prévention, équipement de protection individuelle

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### INTRODUCTION

Informational interventions have earlier been used at work places, in traffic and in the home with the goal of improving safety and decreasing accidents. Films, posters, letters and other sources of information easily reach a large number of people. Before any positive change can be expected in the number or seriousness of accidents, the campaign material has to be seen, understood and acted upon. Relatively little research has been done to measure how these goals actually are attained (Saarela, 1991).

In practice, informational interventions generally have been successful, although some have not. For example, Kaestner *et al.* (1967) successfully used letters to reduce traffic accidents, Laner and Shell (1960) produced changes in safety behaviour with a poster campaign in the steel industry, and Saarela *et al.* (1989) reduced accidents by placing safety posters at the shipyards. On the other hand, the use of seat belts did not increase after a television campaign (Robertson *et al.*, 1974) and a guide book and posters did not affect safety and accidents on construction sites (Saarela *et al.*, 1992). Lehto and Foley (1991) concluded that reading of warning labels and manuals and participation in training courses were not significantly related to the use of helmets when driving

all-terrain vehicles. Helmet use was significantly higher when required by law.

The subject of this study was reindeer herding work, which is a traditional occupation in the northern parts of Finland. There are about 200 000 reindeer and 7000 reindeer owners in Finland. Half of the owners are involved in reindeer herding work, and about 20% of them are Lapps. The reindeer herding area is divided into 56 districts and each herder works as a private entrepreneur in his own district. For many farmers herding is a secondary occupation, especially in the southern part of the reindeer herding area. In the very north the herders are mostly full time. The seasonal rhythm is a characteristic feature of the work. The busiest times are in the late autumn, when the reindeer are gathered, counted, separated for slaughtering and slaughtered, and during early summer, when the newly born fawns are marked. Feeding the reindeer during the spring has recently become more common. The work is done in severe climatic conditions and involves much moving around in the wilderness.

Reindeer herding and associated research are carried out in all the Nordic countries, the Soviet Union, Canada and the United States (Nieminen, 1988). However, accident risks have been studied only in Finland, where two aspects of the

herders' work have been previously researched. First, accidents while using snowmobiles were investigated by distributing a questionnaire survey in 1980-81 (Virokannas and Pekkarinen, 1984). Second, during the winter of 1984-85 field slaughter facilities were studied in order to develop a good model for export slaughter plants (Anttonen *et al.*, 1985).

The present study is a part of a larger project. At first the number and type of accidents occurring in reindeer herding were identified (Pekkarinen *et al.*, 1988). During one year a total of 30% of the reindeer herders had been involved in some kind of occupational accident. Most of the accidents occurred during slaughtering or gathering the reindeer for separation and during separation work. Those accidents that occurred during herding work (normally done with snowmobiles) had the most serious results. On the basis of this knowledge and literature, preventive measures for different work phases of reindeer herding were developed.

The purpose of this part of the study was to carry out intervention by passing on information about the preventive measures to the reindeer herders in three different ways and to ascertain the influence of information on their behaviour and safety. Implemented measures, use of personal protective equipment and accidents occurring were compared before and after the intervention.

#### MATERIAL AND METHODS

A list of reindeer owners in 1983-84 formed the basis of the study. A group of 3324 men who were 16-64 years old and worked yearly one day or more in the reindeer herding field were selected from the list. The first questionnaire was sent to them in the beginning of 1986. In the questionnaire, the herders were asked questions about the accident situation and the use of personal protective equipment in 1985. A total of 2240 (73.4%) replies was received.

In a follow-up questionnaire, accidents in 1987 and the use of personal protective equipment were investigated. The herders were asked the same questions as in the first questionnaire and were also asked about preventive measures that had been implemented in the intervening time. By 1987 the study group had diminished by 203 people, who had died, moved away from the reindeer herding area or finished reindeer herding. Replies to the follow-up questionnaire were received from 1894 herders (60.7%).

For the intervention the reindeer herding districts were divided into three groups, aiming at geographic and socio-economic equality. Since information concerning the wealth and health situation was not available beforehand, the geographic location of districts was the main criterion for division into three groups. Three districts were left out, as they did not want to participate in the study. Finally groups A and C consisted of 18 districts and group B of 17 districts. The number of herders and respondents, their average age and days yearly worked in reindeer herding for each group are presented in Table 1.

In Group A the leaders of the district and the contact men received eight "theme" letters during one year from the researchers, in which 34 easy and practical preventive

measures were suggested for different work phases. They were advised to inform herders of their own district about the measures. Group B herders were informed during medical examinations about accident prevention, mainly concerning the use of personal protective equipment and ergonomic ways of working. This was done by the occupational health personnel who had taken part in a course in which the principles of accident prevention were taught. Group C herders received no special information on accident prevention but could read general information about the study in the press. Thus Group C acted as a control group.

In these three groups the number of measures taken was studied and the accidents occurring were compared with each other. All accidents, even the minor ones, noted in the questionnaires by herders were included. The accident rate was calculated as number of accidents/1000 working days. A chi-square test of the cross-correlation tables and a one-way analysis of variance means were used in the comparisons.

#### RESULTS

In the first questionnaire 30% of the herders responded that it would be impossible to reduce the accident risks in an occupation where work is done mainly under natural, uncontrolled conditions. However, the follow-up questionnaire showed that the herders had implemented an average of 5.8 measures/herder after the intervention. Table 2 shows the groups and how many preventive measures the herders reported having implemented in each group. The herders in groups A and C had implemented the measures equally and group B herders the fewest. The difference was statistically significant ( $F = 4.07$ ,  $p = 0.0172$ ). The p-values of single measure groups are presented in Table 2.

The development of slaughtering places was the most frequent measure implemented, for example, by moving slaughtering indoors, acquiring lifting mechanisms, using warm water for butchers, improving the lighting and repairing the working surfaces. Repairs made to separation places for the reindeer were also frequent, which consisted of improving the lighting, working surfaces and fences. Many reindeer herders had also acquired new working and auxiliary equipment, such as snowmobiles, all-terrain vehicles, better knives and personal protective equipment, such as helmets, eye and

TABLE 1. Basic data on the intervention groups

	A	B	C	Together
Number of districts	18	17	18	53
<b>Basic group in 1985</b>	1157	1065	1102	3324
Number of respondents	818	781	841	2440
Response percentage	70.7	73.3	76.3	73.4
Average age	41.5	42.0	40.3	41.2
Average days/year spent in reindeer herding	74.0	74.1	71.8	73.3
<b>Basic group in 1987</b>	1077	1016	1028	3121
Number of respondents	629	629	636	1894
Response percentage	58.4	61.9	61.9	60.7
Average age	43.9	44.0	42.1	43.3
Average days/year spent in reindeer herding	99.8	97.7	101.9	99.8

TABLE 2. Number of preventive measures in the intervention groups according to the repeat questionnaire

	A	B	C	
Number of respondents	629	629	636	
Structural repairs of separation places	851	756	917	F=5.94 p=0.0027
Structural repairs of slaughtering places	967	865	981	F=2.32 p=0.0983
Places, equipment and ways of repair and service work	58	71	116	F=7.22 p=0.0008
Acquiring working and auxiliary equipment	948	846	951	F=2.17 p=0.1140
Acquiring personal protective equipment	469	427	424	F=0.42 p=0.6541
Improving the ergonomics of lifting	445	458	471	F=0.20 p=0.8191
All measures together	3738	3423	3860	
Number of measures/ respondent	5.9	5.4	6.1	F=4.07 p=0.0172

face protectors, protective aprons for slaughtering and slip-resistant shoes.

The use of personal protective equipment when driving a snowmobile was asked about in the questionnaires, as it indicates the attitudes towards safety measures in reindeer herders' work. According to the first questionnaire, only 3.5% of herders always used a helmet and 5% always used eye/face protectors when driving a snowmobile. After the intervention the number of users almost doubled: 5% always used helmets and 10% used eye/face protectors.

Table 3 shows the extent to which protectors are used in different groups. The number of constant helmet users had increased in all groups, but there was no significant difference between the groups ( $X^2 = 1.42$ ,  $p = 0.841$ ). Eye/face protectors were on the whole more common than helmets in all groups. In group A the number of users had tripled in comparison with the previous situation. There were also some new users in groups B and C, but not as many as in group A. The difference was statistically significant ( $X^2 = 12.6$ ,  $p = 0.014$ ).

The source of safety information was most often the press (32%) according to the follow-up questionnaire. Information was also received from other reindeer herders (14%), occupational health personnel (12%) and letters (12%). It is remarkable that there were only small differences between the three groups for source of safety information.

The accident rate was decreased in two years from 20 to 15 accidents/1000 working days. Table 4 shows the accident rate for 1985 and 1987 in different groups. Development was positive in all groups. The starting situation was best in group A, but development was faster in groups B and C, where the starting situation was worse. The difference between the groups was not statistically significant ( $F = 0.01$ ,  $p = 0.987$ ).

TABLE 3. The percentage of reindeer herders who used protective equipment when driving snowmobiles

	1985			1987		
	A	B	C	A	B	C
Helmet						
— Never	85.1	83.7	86.0	83.5	81.9	84.3
— Sometimes	11.8	11.9	11.9	11.1	11.8	11.3
— Always nowadays	3.1	4.4	2.1	5.4	6.3	4.4
Number of respondents	578	570	614	387	365	363
Eye/face protector						
— Never	56.2	54.5	62.8	63.3	59.2	67.7
— Sometimes	39.7	39.4	32.7	23.8	31.2	25.1
— Always nowadays	4.2	6.1	4.6	12.9	9.6	7.2
Number of respondents	577	574	615	387	365	359

TABLE 4. Accidents occurring in the intervention groups in 1985 and 1987

	1985			1987		
	A	B	C	A	B	C
Number of respondents	674	664	700	498	500	506
Number of accidents/ 1000 working days	18.7	21.0	19.2	15.1	14.9	14.6

## DISCUSSION

If the whole study group is considered, many positive results were achieved. Preventive measures (34) were successfully developed for reindeer herding work, even though in the first questionnaire one-third of the herders thought they would be impossible to implement. Another positive result was that the herders had implemented many measures, an average of 5.8 measures/respondent. The technical measures concentrated on separation and slaughtering places, which were developed and repaired. This might also have had an influence on occupational accidents, as the majority occurred in separation and slaughtering work.

According to the earlier study (Virokannas and Pekkarinen, 1984), most of the injuries in snowmobile accidents were caused to the head, and their consequences were most serious. Thus it is clear that helmet and eye/face protectors are needed when driving. The number of those who wore personal protective equipment when driving a snowmobile doubled during the two years for the whole study group. However, the portion of users is still very low and more effective strategies are needed. According to Lehto and Foley (1991), the use of helmets is highest when required by law.

The decrease of the accident rate was remarkable during the two years: from 20 to 15. A questionnaire was found to be quite reliable in safety research, according to Klen and Väyrynen (1984), who studied loggers' safety. The reliability of a questionnaire can be distorted, since less serious accidents might be forgotten and some accidents are not mentioned because the victim feels guilty. In this study, both exaggeration of accidents and neglecting to report them might compensate for each other.

The response rate to the questionnaires (73% in 1985 and 61% in 1987) was quite high compared to questionnaire surveys in general. Those who participated in the first

questionnaire were older, owned more reindeer and worked more in reindeer herding than those who did not participate. Furthermore, the follow-up questionnaire was not completed by younger herders who owned fewer reindeer and spent fewer days reindeer herding. It is clear that those who were interested in reindeer herding participated more willingly and were also more eager to develop their work.

Intervention studies have many problems that may lead to contradictory results (Saari, 1985). The special attention given to the reindeer herders might have affected their behaviour towards implementing the measures. The questionnaire itself may act as an intervention by giving ideas and new points of views. Some of the suggested measures were the kind that are implemented anyway in the course of the herders' work. The accident rate was so high in the beginning of the study that in practice there was only one possible trend.

When the three different groups were compared, it was obvious that information did not reach the reindeer herders as planned. The only statistical differences among the groups that received information from different sources were found in the use of eye/face protectors when driving a snowmobile and in some groups of implemented measures (structural repairs of separation places and equipment and ways of repair and service work). The number of most implemented measures, the increase in the use of helmets and the decrease of accident rates were about equal in all groups.

One reason for this was that there were problems dividing the districts into three study groups. When the herders of the groups were compared, it was found that the herders of the control group were the youngest but they also showed the highest increase in time spent annually in reindeer herding. So they might also have been most active in looking for safety information and developing their work. The reindeer herders are also in contact with each other, for example, during separations in neighbouring districts. So information leaks may have occurred. The mass media has great power and also took an interest in reporting on the study when it was occurring.

In conclusion, it was possible to develop preventive measures and to influence the safety habits of reindeer herders by disseminating information. General information from the press, the questionnaire itself and the special attention given to the reindeer herders appear to have had the greatest effect on the outcome of the study.

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