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Protection of the head and eyes in forestry work

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VÄYRYNEN ST. Protection of the head and eyes in forestry work. *Scand j work environ health* 9 (1983) 204–207. The helmet used in forestry work is the same as that in industrial use. The eye protector, which is usually a face shield made from wire mesh, is fastened to the helmet. The aim of the present study was the clarification of the frequency of use of, the protection afforded by, and the need for improvement in the helmet and eye protector. A questionnaire, an interview, observations, accident and near-accident reports, and user and laboratory tests were used for this purpose. Eighty-eight percent of loggers always use a helmet, and 32 % an eye protector. According to official statistics and the questionnaire, in 1980, 8 to 15 of every 100 accidents in logging injured the head or eyes. Loggers reported that the helmet was too hot in summer and too cold in winter. The low utilization rate for eye protectors is partly explained by design defects. The protectors become frosted in the winter; there is poor visibility through the protectors when it rains or is dark; the protectors cause glare in sunshine. Product development seems to be necessary so that the helmet and eye protector can better fulfill the special requirements of forestry work.

Key terms: accidents, eye protector, helmet, personal protective equipment.

Personal protective equipment, eg, safety helmets and eye protectors, are necessary in motor-manual logging. During felling, falling branches and other tree parts endanger the head. Eyes are frequently exposed to flying particles such as chips of wood and sawdust. Though most injuries are slight, in severe cases the loss of an eye can ensue.

The aim of the present study is to describe the features, the frequency of use, and the protective effect of the helmet and eye protector so that the design of this equipment can be improved. The investigation was carried out with the aid of a postal questionnaire mailed to 1,200 loggers, an interview (N = 55), observations of the positions of the head (N = 5,100), accident and near-accident reports, and user and laboratory tests. The response rate of the questionnaire was 91 %. The user tests were made under

both summer and winter conditions so that the loggers could compare the protectors in a variety of circumstances.

Types and use of helmets and eye protectors

A logger's safety equipment for the head includes a helmet, an eye protector, and ear protectors (fig 1). The helmet used in forestry work is the same as that used in industry. The eye protector, which is usually a face shield made from wire mesh, is fastened to the helmet and usually covers the whole face (fig 1). The same types of protectors are used in both summer and winter. Eye protectors, made of nets of steel or plastic, are colored black or grey. The holes in the net are square with a side length varying from 1.2 to 2.3 mm; the thickness of the net wire is from 0.25 to 0.40 mm.

In principle, the use of a helmet, an eye protector, and ear protectors is compulsory during forest work in Finland. The average frequency of use of the helmet was 94 % in the previously mentioned questionnaire;

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the corresponding figure for the eye protector was 54 %. Only 32 % of the loggers always used the eye protector. The use of eye protectors decreases in winter.

Accidents and near-accidents

Accidents and near-accidents were investigated on the basis of the questionnaire and statistics from the National Board of Labour Protection (3). The total number of loggers and floating workers in Finland was 27,000 in 1980; 4,179 accidents which led to more than 3 d of absence from work were recorded. Seventy-five percent of these accidents occurred during logging. The accident rate was 108 per 1,000,000 workhours, in comparison to 36 for all occupations. The most frequently injured parts of a loggers's body were the legs and feet (55 %). Eighty-three percent of the accidents caused by chips, sawdust, etc, flung from chain saws involved the head or eyes; 19 % of the accidents were caused by the object being worked on with a chain saw. Chain saws were implicated in 72 % of the head injuries and half of the eye accidents. Most often the cause was the object being worked on. Forty-five percent of the head accidents occurred during felling, and 34 % during limbing. Limbing and bunching were the most dangerous tasks in respect to eye injuries.

The percentage of accidents which injured the head or eyes varied from 8 to 15 according to the questionnaire and statistics (table 1). The number of fatal head injuries in motor-manual logging was four in Finland in 1980. The annual motor-manual logging accident rate was 180 per 1,000 workers according to the questionnaire. The rate was highest in felling, twice the total rate.

Twenty-seven percent of the chain saw operators reported near-accidents which had occurred within the last year and in which some protective equipment had

prevented harmful consequences. The helmet prevented 27 % and the eye protector 3 % of all the prevented injuries (cf table 1). The injuries prevented by eye protectors are very difficult to detect objectively by this incident reporting technique. Seventeen of the 1,090 loggers who responded to the questionnaire reported that the helmet had broken during the near-accident.

Fig 1. Most common (70 % of users) combination of logger's head protective equipment used in Finland. The helmet is made from poly(acrylonitrile-butadiene-styrene)plastic. The combination weighs 0.65 kg. In winter the helmet is often equipped with a warm underhat and a waterproof liner which together increase the weight of the combination by about 0.2 kg.

Table 1. Head and eye accidents and near-accidents as the percentage of all accidents and near-accidents in logging according to the various sources in 1980.

	Source	Head accidents (%)	Eye accidents (%)
Accidents in logging	Official statistics (3)	4.9	3.0
Accidents in motor-manual logging	Questionnaire	6.8	8.6
Near-accidents in motor-manual logging	Questionnaire	29.2	1.4

Need for improvements

Personal protective equipment must meet safety criteria and also be acceptable to the wearer. Data were obtained about both protection and comfort in the questionnaire, interview, laboratory tests, and observations. The properties of the helmet and eye protector for outdoor work have been reviewed in the literature (1, 2, 4, 5).

The loggers thought that the most important item in need of improvement was the eye protector (57 %). During interviews loggers stated that the main reasons they did not use eye protectors were because the protectors became frosted in winter, there was poor visibility through them when conditions were rainy or dark, the eye protectors caused glare in sunshine, they were not durable, and loggers were not familiar with their use.

In the questionnaire 1.5 % of the loggers reported that the poor visibility through the net of the eye protectors had caused

an accident within the last year. The light transmission loss of both the netting used in eye protectors and of plastic sheets was measured in the laboratory. It ranged from 55 to 80 % for different nets and was 88 % for polycarbonate plastic sheet. Glare was related to the color of the net. A light colored net caused more glare in sunshine than a dark colored one.

The most common problems related to helmet use, as listed by Klen (2), were sweating in summer heat, coldness in winter, and weight. During the interviews the loggers confirmed these summer (85 %) and winter (70 %) problems. Seventy percent said that the helmet does not sufficiently protect the neck during tree felling. According to the observation study 10–12 % of the workhours of loggers were spent felling trees. In about 55 % of the workhours in felling the head was in a position in which the neck was not protected (fig 2).

Conclusions

The logger's helmet is both essential and effective. However improvements are necessary so that the special requirements of forestry can better be met. For example, ventilation should be increased in the summer and, if possible, it should be adjustable. Another solution would be the construction of different helmet types for use in summer and winter. The helmet used in forestry should also be designed for integrated use with the ear and eye protectors. It should be as light as possible.

Eye protectors are not only important in injury prevention, but they also prevent small noninjuring particles from being flung into a logger's eyes where they can cause irritation and time loss. Visibility should be better, especially under dark or cold conditions, so that the protectors can be worn regardless of the season or weather conditions.

Finally, for protective equipment to be acceptable for continuous wear, it must be as comfortable as possible.

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Fig 2. The helmet does not protect the neck during felling, which is the most dangerous task in so far as head injuries are concerned.

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