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*Study report*

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# CHAIN SAW OPERATORS' OPINIONS OF CHAIN SAW VIBRATION

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# Chain saw operators' opinions of chain saw vibration.

## A questionnaire study

by Kauko Turtiainen, Forester \*

*Turtiainen, K. Work-environm.-hlth 11 (1974) 132—135. Chain saw operators' opinions of chain saw vibration: A questionnaire study.* This questionnaire study comprised 589 lumbermen in different parts of Finland who had used chain saws for at least 3 years. The average age of chain saw operators was 37.9 years. In all, 74 % had used chain saws for more than 6 years. The mean sawing time per month was 22.3 days. The mean operating time per day when the saw was not used for limbing was 2.8 hours, and when all branches were limbed, 5.1 hours. Saw vibration was considered too intense by 69 % and moderate by 26 %. Vibration had caused subjective injuries to operators' hands. The hands of 61 % of the operators grew numb at night, and 49 % suffered from white fingers. A total of 55 % of the smokers complained of numbness in the hands and 67 % of white fingers, while the corresponding rates among nonsmokers were 35 % and 47 %, respectively. On an average, hand symptoms appeared after 2.2 years with the chain saw. An increase in hand symptoms was reported for winter when the hands or the whole body got cold and wet during work and traveling to and from the site. The chain saw operator's best working age is between 20 and 50 years.

The use of chain saws in Finland increased from the beginning of the 1950's to 1970. At that time the import of saws was at its peak, i.e., 45,297 saws. In 1971, the number of chain saws imported was 34,994 and in 1972, 31,686. The import trend has been decreasing since 1971. At present, there are about 160,000 saws in use in Finland. The chain saw is a fairly new tool in tree harvesting, it has been used for only a little more than 20 years. This is one of the reasons why there has not been any definite proof that injuries were caused by saws. Towards the end of the 1960's there were several workers who had used chain saws continually during the winter for more than 10 years. At that time changes also took place in the working methods. Until then the saw had only been used for felling and bucking, but at the end of the 1960's the saw was also

increasingly being used for limbing all branches. Thus the daily operating time of the saw, the running time of the engine, rose from 2 to 5 hours. Previously lumbermen used chain saws less in winter, but in recent years they have used them year round.

In 1963 according to Bailey (1), it was uncertain whether chain saw vibration in saws with low chain speed was injurious to the operator's health. In the U.S.A. and Canada saw vibration had not become a serious problem. Bailey mentions, however, that there should be frequent rest periods in order to reduce injuries which may be caused by saw vibration, especially during limbing with saws with high chain speed.

There has previously been no study that comprehensively surveyed hand symptoms caused by saw vibration. In Sweden, investigations concerning lumbermen's health were made in the 1960's. These investigations comprised 290 chain saw operators who had been working with chain saws continually for at least 6

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months, 70 % of them had used these saws for more than 6 years. It was observed that 49 % of the workers subjectively suffered from finger complaints caused by vibration. However, 12 % of lumbermen who had never used chain saws also had finger complaints (2).

After changes in working methods, more chain saw operators complained that their hands grew numb at night and that their fingers became white during the day. This gave stimulus to the present investigation, which by means of a questionnaire explored to what extent chain saw vibration might cause health injuries to operators.

## MATERIAL AND METHODS

The questionnaire study was carried out in 1968—69. The questions concerned the operator's age; previous use of the saw, both seasonally and year round; number of months/year, days/month and hours/day the saw was used; grouping of the work; use and kind of gloves, in summer and in winter; smoking habits; subjective intensity of saw vibration; whether vibration caused hand injuries; how soon hand diseases had appeared; consulting a doctor because of hand diseases; and other related questions.

The investigation was directed to chain saw operators employed by the National Board of Forestry and the wood industries who had used chain saws for at least 3 years. The author distributed most of the questionnaires to the chain saw operators of the big forest sites in northern Finland. The rest were mailed to southern and central Finland. The operators were divided into two groups: those who used chain saws continually (group 1) and those who used them sporadically (group 2). Group 1 consisted of those who had used saws year round for the last 3 years, and before that sporadically. Group 2 consisted of lumbermen who had used these saws year round for less than 3 years and in addition sporadically each year, as well as those who had used chain saws off an on for 3 years.

Altogether 600 questionnaires were distributed and 589 (98.2 %) replies received.

The mean age of the chain saw operators

Table 1. Age distribution of chain saw users.

Age, yrs	Persons	% of replies
20—25	37	6
26—30	76	13
31—35	139	24
36—40	121	21
41—45	108	18
46—50	64	11
51—55	26	4
56—60	12	2
61—65	6	1
Total	589	100

was  $37.9 \pm 8.5$  years; 63 % were between 31 and 45 years of age (table 1).

The distribution of chain saw operators ( $N = 435$ ) who had worked for at least 3 years year round and otherwise mainly during the winter is given in table 3.

## RESULTS

The chain saw operators in group 1 had used saws throughout the year for  $5.8 \pm 4.4$  years (mean and standard deviation). The mean time for those using saws sporadically (group 2) was  $4.1 \pm 4.4$  years. All chain saw operators used the saw a mean number of  $22.3 \pm 2.5$  days/month. When all branches were not limbed with the saw, the mean running time per day was  $2.8 \pm 0.9$  hours. When all branches were limbed with the saw, the mean running time of the saw per day was  $5.1 \pm 1.4$  hours.

Of all chain saw operators, 91 % did sawing and piling every day. Gloves were always used in summer by 60 %, generally by 20 %, and not at all by 20 %. In winter, leather mittens were used by 93 % of the chain saw operators; 15 % also had rubber mittens. Gloves were used by 5 % and mittens with a forefinger, by 2 %.

In all, 64 % of the chain saw operators were smokers; 52 % smoked cigarettes, 8 % a pipe and 18 % self-rolled cigarettes. Cigarette smokers smoked an average of  $12.5 \pm 10.7$  cigarettes per day. The smokers had smoked  $12.2 \pm 10.9$  years on the average.

A total of 69 % of the chain saw operators considered the vibration of the saw

Table 2. Prevalence of hand symptoms in 589 chain saw operators.

Symptoms	Prevalence %	90 % c.l.*
1. Fingers white	49	45—53
2. Fingers sensitive to cold	48	44—52
3. Hands grow numb at night	61	57—65

\* 95 % confidence limits for the prevalence of hand symptoms.

Table 3. Prevalence of white fingers in chain saw operators who have used a chain saw continually, according to sawing years.

Sawing years	N	Prevalence of white fingers	
		Persons	%
6—9	145	71	49.0
10—14	203	103	50.7
15—19	78	47	60.3
≥20	9	7	77.8
Total	435	228	52.4

too intense, 26 % moderate, and 5 % felt that the vibration was not injurious. In 1968—69 we had little experience with vibration dampers.

Among all chain saw operators, 49 % had white fingers, the fingers of 48 % were sensitive to cold, and the hands of 61 % grew numb at night (table 2 and fig. 1).

Of the hand symptoms, numbness of hands and white fingers appeared first. On the average, these symptoms were revealed after 2.2 years with the saw. Only 8 % of the chain saw operators, i.e., 48 men had consulted a doctor because of hand symptoms.

In those who sawed continually for 6 to 14 years (group 1) the prevalence of white fingers was approximately 50 %. This prevalence increased along with the sawing years (table 3).

Among those who used chain saws sporadically, 38 % had white fingers and 60 % reported numbness in hands. Among smokers, white fingers occurred in 55 %, and in nonsmokers in 35 %. A similar difference applied to numbness; 67 %

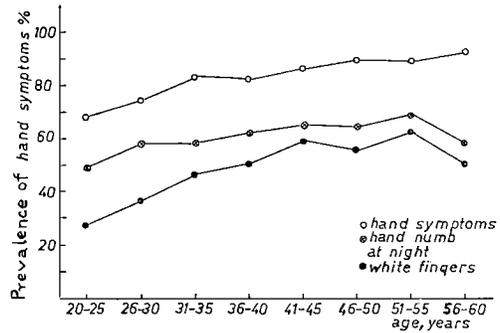


Fig. 1. Hand symptoms among chain saw operators (N = 589), who had used the saw at least for 3 years.

among smokers as against 47 % among nonsmokers. Hand symptoms, numbness and white fingers were more frequent in older chain saw operators than in younger ones (fig. 1).

Chain saw operators felt that symptoms in the hand are generated by vibration and by cold. In the opinion of several workers, the hands and the body should be kept dry and warm throughout the whole work day, including traveling to and from the site.

The chain saw operators considered their best working age to be between 20 and 50 years. According to fig. 1, over 90 % of those above 50 years of age suffered from hand symptoms and approximately 65 % of them from white fingers.

## DISCUSSION

The chain saw operators average age was 37.9 years. Of the participants in the investigation, 93 % were from 20 to 50 years of age. It is surprising that white fingers occurred among half of the participants in the study, since their work has been quite diversified.

In a study of the health of lumbermen which was carried out by the Labor Pension Fund in Finland and comprised 286 chain saw operators, 75 % had various finger symptoms. Sixty per cent of the complaints were only slight and 40 % were severe (3, p. 5). In a questionnaire study carried out in Sweden (2) on chain saw operators, 49 % suffered from finger

complaints caused by vibration. In a clinical study of 80 lumbermen who had complained of hand symptoms, approximately 50 % showed very clear Raynaud symptoms. In addition, 20 % felt numbness and prickling in their hands (2).

In addition to vibration caused by saws, the fact that the hands and body get cold and wet is very likely to have an influence on the generation of hand symptoms. It is important to keep the body dry and warm throughout the whole work day, including traveling to and from the site. Clothes should be suitable for all types of weather,

and there should be dry work clothes and gloves available on the site.

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