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OCCUPATIONAL SAFETY RESEARCH IN FINLAND

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ABSTRACT

This article is a literature review of Finnish occupational safety research. First, we present some background information on Finland and its population. Then we describe the accident insurance system of Finland and provide information on occupational injuries. Finnish occupational safety legislation is based on the directives of the European Union, and several studies exist on the implementation of these laws.

We examined several factors related to occupational injuries. First we studied gender difference in injury involvement. It was shown that inexperienced workers seemed to be a higher risk of occupational injury. Next we studied high risk industries such as agriculture, construction, forestry, sea faring and health care.

Specific occupational injury risks have been studied in Finland. Electrical accidents were rare but dangerous. Crane accidents were critical, especially at construction sites. Increased migration to Finland may increase the risk of occupational injury at workplaces. Although long-term unemployment is high in Finland, there is no connection with fatal accidents at work. Results related to the effects of temporary contracts on occupational injury involvement were contradictory. Stress factors increased the risk of occupational injury.

Violence has increased considerably at Finnish workplaces in the last 30 years. Violence towards women has increased more than that towards men. Health care employees today encountered violent patients much more often than previously.

INTRODUCTION

Finland is a republic in Northern Europe between Sweden and Russia. The population was 5 429 894 at the end of February 2013 and the geographical area is 303 892 km². Thus population density is 17.87 persons/km², which is one of the lowest in Europe. The capital city is Helsinki, with 600 000 inhabitants (Yle, 2013).

The number of employed people in Finland in 2010 was 2.4 million (Statistics Finland, 2010). Of these, 68% worked in services, 7% in the construction industry, 22% in manufacturing and 3% in agriculture and forestry (Elinkeinoelämän keskusliitto, 2011).

The main research institute for occupational safety in Finland is the Finnish Institute of Occupational Health (FIOH). "Occupational Safety and Ergonomics" research team consists of about 30 researchers. The state supports FIOH's operations, although half of its funding comes from research funds and services sold to companies. The Department of Industrial Management at the Tampere University of Technology trains engineers to become occupational safety managers. The department has about 20 researchers, who mostly study safety management and risk control. Finland's Technical Research Center VTT concentrated on the risk control, safety and reliability of technical systems; about 20 researchers work with these issues.

OCCUPATIONAL ACCIDENTS

Finnish law states that all employer must have accident insurance for every salaried worker. This insurance is provided by thirteen private companies. If an accident causes at least four days of absence, the employer can receive compensation from an insurance company. Injured workers receive their full salaries during sick leave. Thus there is a financial incentive for companies to make a compensation claim (Tynkkynen, 2012).

In Finland, 127 620 occupational accidents occurred in 2009. Accident frequency (accidents resulting in four or more days of absence per 10 000 employees) was 52.95. There were 48 fatal accidents at work, which means a fatality rate of 1.2 per 100 000 employees (Statistics Finland, 2011). Men were injured in 65% of occupational injuries. Young workers under the age of 25 were injured in 15% of the accidents, and workers older than 50 years of age in 28% of the accidents. Occupational injuries occurred most often in municipalities (20%), in the manufacturing industry (19%), and in the construction industry (12%). Falls (20%), stepping on sharp objects (15%) and overexertion (14%) were the most common types of injuries. The most typical injuries were sprains and dislocations (35%), wounds (34%), and internal organ injuries (17%).

Accident investigation

There is a special investigation system for fatal occupational accidents. A group including a safety specialist from the insurance company, trade union representatives, and sometimes a researcher from a research institute investigates the fatal accident at the accident site and writes a report for each case. These reports are spread to companies throughout the country.

A study of 38 companies from the metal and transportation industry showed that accident information was rarely applied in practice. In the majority of the companies, the fatal accident report was sent to the safety committee, but in other companies it served as independent reading material. The companies wished to receive the report more quickly, that it be published electronically, and that it would be classified according to the type of accident (Lind & Kivistö-Rahnasto, 2008).

Occupational safety legislation

The first legislation on occupational safety came into force in Finland in 1889. The current legal framework is based on two fundamental laws – the Occupational Safety and Health Act (2002) and the Occupational Health Care Act (1978) (Yrjänheikki & Savolainen, 2000).

Because Finland is a member of the European Union, its occupational safety and health legislation is based on EU directives. The basic elements of the Occupational Safety and Health Act are workplace risk assessment and occupational safety plans. The aim of the law is to prevent all hazards at the workplace. According to the law, the main responsibility for prevention rests with the employer (Finlex, 2002).

The implementation of the Directives was studied both at workplaces and based on opinions of the safety inspectors. A survey of safety managers and safety representatives showed that the new Occupational Safety and Health Act had successfully reached workplaces three years after implementation. For example, four out of five workplaces carried out risk assessment and had safety action plans. The new law has extended from occupational safety in the manufacturing industry to that in the service industry. The law also includes actions to prevent violence at workplaces, especially at wholesale, finance and health care workplaces (Salminen et al., 2007).

The Act on Occupational Safety and Health Enforcement and Cooperation on Occupational Safety and Health at Workplaces determines the work of occupational safety inspectors. They have the right to inspect working conditions at workplaces and to investigate serious accidents. A skeleton law also includes co-operation between the employer and employees at workplaces (Finlex, 2006).

A survey of workplaces produced a positive evaluation of the enforcement of the law by the authorities and of its effects on workplace safety and health. The enforcement was regarded as professionally carried out, and the inspection as having considered essential matters. The inspection also led to corrections of shortcomings noticed at the workplace (Uusitalo et al., 2012).

The responses on a questionnaire study on safety compliance legislation given to safety managers and the workers of the companies were classified into three factors: “contribution measures”, “concrete preventive measures” and “risk assessment process”. For risk assessment, four factors were identified: “planning, guidelines, policy, management”, “prioritization of proactive measures”, “results in cooperation and information”, and “active use of risks assessment document”. Both the risk assessment process and contribution measures had a significant effect on concrete preventive measures (Niskanen et al., 2012).

Niskanen (2013) highlighted five factors regarding the present situation of OSH enforcement in the results of the safety inspectors' internet questionnaire: Factor 1: "Effectiveness by inspection with advices, quality of inspection could be made more effective", Factor 2 "Improving by inspection on operations of safety management systems based on performance agreement", Factor 3 "Effectiveness by harmonizing of activities of the OSH inspectors and OSH inspectorates", Factor 4: "Effectiveness at a distance carried out inspection and follow-up", and Factor 5: "Effectiveness by follow-up enforcement". These factors showed the areas of safety inspectors' work that needed improving.

Occupational injury

Gender

Men were more often victims of occupational injuries, as they represented 51.6% of the workforce (www.stat.fi) and 65.5% of occupational injury victims in 2008 (Tapaturmavakuutuslaitosten Liitto, 2010). The accident frequency among men was 34.27 per 1000 workers, which was 1.81 times higher than that among women (18.89).

Two reviews (Salminen et al., 1992a; Messing et al., 1994) showed that men were involved in occupational injuries three times more often than women. This fact is explained by the higher risk-taking tendency of men (Byrnes et al., 1999), and their higher proportion in industries with high risks of occupational injury. However, there was no gender difference in risk-taking among Finnish occupational injury victims (Salminen, 1994a). It was also shown that Finnish women were seriously injured by manually controlled machines or hand tools during work on production lines (Salminen et al., 1992a).

Experience

Inexperienced workers who had been in the service of their employer for less than one year were at an increased risk of occupational injury (Salminen, 1994b). New employees suffered injuries when using hand tools and moving things from one place to another. Falls and injuries caused by moving parts of machines were also typical accidents among inexperienced workers (Salminen et al., 1992b).

Different industries

Males were more often (88.6%) victims of fatal agricultural injuries in Finland. The most typical cause of fatality was tractor turnover (Rissanen & Taattola, 2003). Three out of four women's farm injuries were related to animals (Kallioniemi et al., 2011). Men were injured more often on farms, whereas women more often had occupational diseases (Rautiainen et al., 2005; Karttunen & Rautiainen, 2013). Finnish-speaking farmers had a higher injury rate than Swedish-speaking farmers (Virtanen et al., 2003).

The construction industry had the second highest injury rate in Finland. The building of frames and roof structures were the building phases with the highest accident frequency (Niskanen & Lauttalammi, 1989a, b). Lifting material caused half of all accidents on Finnish construction sites (Niskanen & Saarsalmi, 1983). Reinforcement workers incurred five times more musculoskeletal injuries than painters (Niskanen, 1985), and subcontractors' workers were at a higher risk of serious occupational injury than main contractors' (Salminen, 1995). Finnish construction workers were injured more often when working in foreign countries such as those of the former Soviet Union than at Finnish construction sites (Pekkarinen & Anttonen, 1989).

Construction injuries can be prevented in several ways. A Behavior Analysis programme decreased accident rates and resulted in less serious accidents on experiment sites (Mattila & Hyödynmaa, 1988). Supervisors with a high safety index spent more time at work sites and gave more feedback to their workers, and had fewer accidents on their sites (Mattila et al., 1994a, b). A three-year safety contest between construction companies prevented 400 accidents and three fatalities per year (Laitinen & Päivärinta, 2010). A Finnish-driven Cochrane review showed that multifaceted safety campaigns and drug-free workplace programmes are effective ways in which to prevent construction injuries (Lehtola et al., 2008).

The forest industry is one of the main cornerstones of the Finnish national economy. This is why the safety of loggers has been studied so much in Finland. The main causes of injuries were losing one's balance, small flying objects, and chain saws. The most typical work phase was delimiting and felling (Salminen et al., 2001). The use of personal protectors prevented 22% of chain saw operators' accidents and near-accidents. Safety boots were the most effective protector (Klen & Väyrynen, 1984). One study showed contradictory results: on the one hand, users of personal protectors were at a higher risk of injury, and on the other hand, wearing personal protectors decreased the number of injuries (Klen, 1997). Loggers' self-reported accidents corresponded well with company-recorded accidents (Klen & Ojanen, 1998).

Teaching a new lifting technique to Finnish loggers decreased accidents caused by bending and twisting the body (Väyrynen & Könönen, 1991). Internal safety inspections using Behavior Analysis improved safety levels and decreased occupational accidents in the veneer industry (Mattila, 1990).

Every tenth death of Finnish seafarers was due to violence, accidents or poisoning (Saarni et al., 1996). However, the accidents rate of seafarers was lower than that of the whole working population. Working and walking on deck, the work environment and physical strain were the main causes of injuries (Saarni, 1989). An accident prevention programme decreased the number of accidents among Finnish stevedoring workers by 20% and the number of serious accidents by 37% (Halme, 1992).

A study covering three health care districts in Finland found a total of 3776 occupational injuries among their employees during 2006-2008. Accident frequency was 119.9 (including accidents resulting in less than four days of absence per 1000 work years), which is higher than the average of the working population in the Work and Health survey (Mattila & Salminen, 2013). Needle stick injuries made up one fourth of occupational injuries, whereas another quarter of injuries occurred on the way to or from the workplace (while commuting) (Salminen & Parantainen, 2012).

Electrical accidents

Electrical professionals suffered on average 21.5 electrical accidents per year between 1996 and 2008. Five of these were fatal. Most of the accidents were caused by an unexpected presence of electrical energy or accidental contact with an energized part that had a technical fault (Tulonen, 2010).

An analysis of 25 electrical accidents in Finland in 1998-1999 revealed that, most of them occurred in a low voltage installation with a nominal voltage of 400 V. However, the accidents with a medium voltage installation were more serious than those with low voltage installations (Mäkinen & Mustonen, 2003).

Crane accidents

About 1% of all occupational accidents in Finland in 1977 occurred when working with cranes. Most injuries occurred as workers were fastening or loosening loads, or steering loads with their hands during lifting. The most common types of injury were hands crushed between the load and lifting gear, blows from lifting, gear and loads, and falling loads. Only 20% of the injured workers were crane operators; their injuries occurred while entering or leaving the cabin (Häkkinen, 1978). Crane accidents fell by about 30% from 1977 to 1990. Crane drivers are often victims of accidents, because they control their cranes at a floor level. Specialist crane drivers were no longer used in many industries (Häkkinen, 1993).

Migration

Finland was home to 177 000 immigrants in 2010, which was 5% of the entire population. The proportion of immigrants in the workforce was 3.5% at the end of 2009 (Reini, 2012). According to a review of 31 studies, foreign-born workers were suffered occupational injuries over twice more often than native workers (Salminen, 2011). However, immigrant bus drivers did not encounter more occupational injuries than Finnish drivers (Salminen et al., 2009).

Unemployment

According to the OECD (2012), the unemployment rate in Finland was 8.4%, but long-term unemployment was an even bigger problem (23.6% of the unemployed). When a high unemployment rate is a sign of economic recession, it usually means a lower accident rate at workplaces (Boone & van Ours, 2006). However, no meaningful connection was found between fatal accidents and business cycles in Finland (Saloniemi & Oksanen, 1998).

Temporary contracts

In Finland about 15% of employees worked with a fixed-term contract. Three different data sets showed, that fixed-term workers did not have a higher occupational injury rate than permanent workers. The most important explanatory factor was that in Finland, fixed term contracts are concentrated in public services such as education and health care which have a predominance of female workers (Saloniemi & Salminen, 2010).

Stress

Psychological stress measured by the General Health Questionnaire (GHQ-12) was not related to occupational injuries among Finnish hospital employees. However, low decision latitude, low skill discretion, and highly monotonous work were stressors that predicted occupational injuries (Salminen et al., 2003). High work

pressure, part-time work and violent clients increased the risk of occupational injury among Finnish civil servants (Hinkka et al., 2013).

The Finnish army

The accident frequency in the Finnish Defence Forces was 21% lower than that of all workers in Finland in 2000. Accidents at work caused 80% of the injuries among military personnel, commuting to or from work caused 15% of the injuries, and 5% were occupational diseases. Occupational diseases are included in accident statistics in Finland, because they are compensated by accident insurance. Over half of occupational injuries occurred during military exercises, one third during other work, and one tenth while commuting to or from work (Lehtomäki et al., 2005).

Workplace noise

Elevated noise level (>90 dB) increased the risk of occupational accident by 40% (Girard et al., 2009). Poor hearing contributed to fatal accidents in some cases in Finland. Workers with hearing handicaps were at an increased risk of injury because they had poor speech intelligibility: they did not hear warning signals or moving vehicles (Toppila et al., 2009).

Connections of occupational injuries

The Victim-study is based on telephone interviews of a representative sample of Finnish residents. Three independent data sets of this study (n=27,635) showed, that correlations between traffic, occupational, sports and home accidents were generally very low ($r = 0.00 - 0.05$). The highest correlations were found between traffic accidents and occupational accidents (0.05), and between traffic accidents and sports injuries (0.05, Salminen & Heiskanen, 1997). On the other hand, the last Victim-study in 2009 showed, that being a victim of crime increased the risk of traffic injury five times and doubled the risk of work- and home injury (Salminen et al., 2011).

Three independent but similar data sets of the National Work and Health Survey showed, that workers involved in occupational injuries were more often also involved in leisure-time injuries than workers not involved in injuries. Less than 1% of the victims had been involved in injuries both at work and during leisure time during the past 12 months (Salminen, 2005). In a large Finnish steel factory, the rate of leisure-time injuries (29 per million hours) was higher than that of workplace injuries (23), but highest in commuting injuries (38). The researchers (Qvist et al., 2004) concluded that injury prevention has been more successful at the workplace than during leisure time.

Costs of occupational accidents

Based on a development model by Maurice Oxenburgh from Australia, Finnish researchers have developed an instrument for economic analysis. By this Potential method it is possible to calculate the costs and effects of occupational safety investments. The calculations showed the refund time of different investments (Bergström, 2005).

Violence at work

Violence at work can cause an injury. If an injury causes at minimum of four days of absence, the employer can claim compensation from their insurance company. On the basis of these compensation claims, the Federation of Accident Insurance Institutions (FAII) has created the Finnish national occupational accidents and diseases statistics database.

In 1994-1996, the average annual number of violent injuries registered as occupational accidents was 459. Two people died each year due to violence at the workplace. Violent injuries occurred mainly in the following occupational divisions: service, health care and social service, sales, and transportation and traffic (Saarela & Isotalus, 1999). The number of violent injuries had increased to 1464 by 2003. Women had a 1.7 times higher incidence rate (number of injuries per 1000 employees) than men. The 20-24 and 35-44 years age groups encountered violence most often (Hintikka & Saarela, 2010).

The Victim study showed that violence towards women at work had increased from 1.0% in 1980 to 5.2% in 2009, whereas violence towards men had remained rather stable (1.9% in 1980, 2.2% in 2009). The growth in violence towards women had occurred mainly in health care occupations (Sirén et al., 2010), in which women work in direct contact with customers (Heiskanen, 2007). The most hazardous occupations in the 1988 survey were those of prison guards, police officers and mental health nurses (Salminen, 1997). During weekend nights, the risk of violence at work was almost ten times higher than during regular office hours (Salminen, 1998).

Every third years, the Finnish Institute of Occupational Health carries out the Work and Health Survey. A random sample of about 2000 working people from the Finnish Population Register, are interviewed. In the first survey in 1997, 4% of respondents had encountered violence at work during the past 12 months (Pirainen et al., 1997). In the last survey in 2012, the proportion of violence victims had increased to 8% (Mattila & Salminen, 2013).

In 1999, Statistics Finland carried out a large survey with over 30 000 respondents. This dataset showed that 5% of the employees had encountered violence at work in the past 12 months. Women encountered violence twice more often than men. Employees between the ages of 25 and 44 had been victims of violence slightly more often than on average. Entrepreneurs did encountered violence as often as wage earners. The highest risk of violence was among mental health nurses, whose risk was nine times higher than the average. Three out of four perpetrators were clients, patients or pupils. One tenth of violent acts were committed by co-workers and another tenth by unknown person (Piispa & Saarela, 2000).

Three different data sets showed that fixed-term employees encountered violence more often than permanent employees. Male fixed-term employees were at a 9% higher risk of violence at work and women at an 11% higher risk than permanent employees (Salminen & Saloniemi, 2010). In addition, Piispa and Saarela (2000) showed that there were more fixed-term employees in the occupations with the highest risk of violence. Part-time employees were also at a slightly increased risk of encountering violence at work.

We can conclude that violence at work has increased at Finnish workplaces. Violence towards women has increased more than that towards men. This increase can be seen especially in health care occupations, in which workers are more prepared to help patients than to encounter violence.

CONCLUSION

This article describes occupational safety research in Finland. It presents empirical results from several authors and several areas of occupational safety. The following conclusions can be drawn on the basis of this literature review:

1. Research activities on occupational safety in Finland are broad and multifaceted.
2. The studies are practical, because most of them have been carried out together with companies.
3. Occupational safety research is coming more prevention orientated
4. Finnish occupational safety research is at the international level.

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