SAFETY ATTITUDES IN NEW ZEALAND FORESTRY

A Thesis
Presented to Massey University
in Partial Fulfilment of the Requirements for the Degree of
Master of Arts in Psychology

RICHARD JOHN GIBSON

1994

ABSTRACT

This study examines the attitudes towards safety, held by workers, contractors, supervisors, and managers employed in the New Zealand forest industry. The study follows the framework offered by Purdham (1984, cited in Cox & Cox, 1991), which divides safety attitudes into safety hardware, safety software, people, and risk. After a review of the literature relating to these object areas, attitudes, and safety, a safety attitude questionnaire that was developed specifically for the study is described.

The questionnaire was administered to 465 people working in the forest industry. The results suggested that the structure provided by Purdham, as well as Cox and Cox (1991) is not entirely apparent, however it can be used to evaluate safety attitudes. Attitudes towards safety hardware were very positive although a number of workers were unaware of the benefits of more recently developed personal protective equipment. Attitudes towards safety software were slightly negative. Many workers were unaware of safety policies and the Health and Safety in Employment Act 1992, and were of the opinion that there was conflict between safety and other job demands.

With regards to people, all groups surveyed had very good attitudes towards responsibility, and realised the importance of safety. Attitudes towards risk were reasonable, but knowledge of objective risk was poor. Results also suggested that the safety climate is rather negative, with many workers not believing that management or their work-mates were committed to safety. Management were also of the opinion that workers would not believe they were committed to safety.

The survey found no relationship between individual attitudes and accident involvement. Training, education, and experience were also unrelated to accident involvement. Finally, management appear to be making attribution errors with regards to the cause of accidents. The implications of these findings for the forest industry, and safety research are discussed.

FOREWORD

Forestry is a major export earner for New Zealand accounting for 10% of total exports (NZFOA, 1992). In 1992, NZ plantation forests covered 1,239,886 hectares, 90% of this is pinus radiata. These forests are usually established at stocking rates of between 800 and 1200 stems per hectare (Gaskin, 1990). To maximise the volume harvested at clearfell, the number of stems per hectare are reduced to final stocking rates of 200 to 350 stems as early as possible (five or six years old). At the age of 30 years, stem masses average around 2.5 tonnes and have very heavy branching. Due to this heavy branching, weight, and the difficult terrain found in many New Zealand forests, mechanised felling and delimbing is often unsuitable, so motor-manual techniques with chainsaws must be used.

The forest industry can be divided into two divisions; logging and silviculture. The term logging is used to describe the process of felling and delimbing trees, dragging or hauling the delimbed trees (stems) to a landing, cutting the stems into graded logs, and loading the logs onto trucks for transportation. Silviculture is used to describe the growing and tending of forest crops. Silviculture jobs include seed collecting, planting trees, thinning to waste, pruning, fertilising, and spraying.

One of the major problems facing the forest industry is the high number of occupational injuries that occur in logging and silviculture. To help address this problem, the Logging Industry Research Organisation (LIRO) has been undertaking research in occupational health, safety, and ergonomics since 1983. In 1993, LIRO received funding from the Foundation for Research, Science, and Technology, to examine forest workers' attitudes towards accident investigations. The author put forward a proposal to expand the study to cover attitudes towards safety in general. This proposal was accepted by LIRO and the forest companies concerned. The author was then employed by LIRO to carry out the study in conjunction with Massey University. As a result, this study has been strongly influenced by the needs of the forest industry, and the practical constraints of conducting research in an applied setting.

ACKNOWLEDGEMENTS

I would like to thank all the staff, contractors, and forest workers from the following companies for their time and co-operation. It was much appreciated.

- Carter Holt Harvey Forests Ltd (Kinleith Region)
- Baigent Forests Division (Nelson)
- Forestry Corporation of New Zealand Ltd (Waiotapu)
- ITT Rayonier New Zealand Ltd (Gisborne Branch)
- Tasman Forestry Ltd (Bay of Plenty District)
- Tasman Forestry Ltd (Murupara)
- Tasman Forestry Ltd (Taupo)
- Wenita Forestry Ltd (Dunedin)

Thanks to my supervisors Dr. Ross St George and Dr. Carol Slappendel for all their suggestions and editing. Thanks also to Dr. Ross Fleet for his input. Special thanks goes to LIRO, who provided the funding, contacts, and guidance to carry out this project; and to all the LIRO staff who made the time I spent at Rotorua enjoyable.

I am also very grateful to Dr. Mike Smith for convincing me to undertake a masters degree. Finally, thanks to all my friends. Although they did not always assist me in completing my thesis, they did ensure the time I spent at Massey University will always be remembered.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1 - INTRODUCTION

Safety and health in occupational settings is a subject of increasing concern and attention (Kaplan & Burch-Minakan, 1986; Sherry, 1991). This rising level of concern is due to a number of factors: occupational injury rates have reached a 12 year high in the United States (Hansen, 1993), reported accident costs for firms are increasing at an annual rate of 15% (Brody, Léfourneau, & Poirier, 1990), and the potential damage that could occur if safety engineering designs fail is now catastrophic (Dwyer, 1992). In New Zealand, the Department of Labour (1993) reported that the total cost of occupational accidents is approximately NZ$ 1 to 1.5 billion, or 2% of Gross Domestic Profit (if medical costs, loss of wages, loss of productivity, and factors such as retraining are taken into account). In 1992-1993, claims for all occupations in New Zealand cost the Accident Compensation Corporation (ACC) NZ$ 520 million, and this figure is increasing each year (Department of Labour, 1993).

One industry that has a very high accident rate both internationally and in New Zealand is forestry (Pettersson 1981; Crowe, 1986; Gaskin, 1988; Forestry & Wood Industries Committee, 1991; Salisbury, Brubaker, Hertzman, & Loeb, 1991). In New Zealand, Gaskin (1988) reported a fatality rate in logging of 2.3 per 1000 workers per year for the period 1968 through to 1987. This is 33 times higher than the national average fatality rate of 0.07 per 1000 workers per year.

The fatality rate in logging has not improved over recent years. Within a work-force of just 2500 people (New Zealand Forest Owners Association, 1993a), there were 7 logging fatalities in 1991, and 9 fatalities in 1992 (Parker, 1993a). In the 1992-1993 financial year, the Occupational Safety and Health Service of the Department of Labour reported that 11 people had been killed in logging accidents in New Zealand (Occupational Safety & Health Service, 1993). The fatality rate in silviculture is much lower than in logging, but still twice the national average (Cryer & Fleming, 1987).

Unfortunately, the high number of fatalities is only part of the safety problem. The Logging Industry Accident Reporting Scheme (ARS) recorded 197 lost-time accidents in 1992 and it is suspected that a large number of

accidents do not get reported to this scheme. ACC expenditure on forestry claims totalled NZ$ 8 million in 1992, which suggests that a very large number of injuries must be occurring. More than half of this cost was for sprain and strain injuries (Accident Compensation Corporation, 1994).

In an attempt to reduce the rising costs of funding New Zealand's accident compensation scheme and improve occupational safety, the New Zealand Government has introduced two new Acts; the Accident Rehabilitation and Compensation Insurance Act 1992 (ARCI Act) and the Health and Safety in Employment Act 1992 (HSE Act).

The ARCI Act introduced a levy system based on the New Zealand Standard Industry Classification (NZSIC) system. Under the NZSIC system, jobs are divided into 28 classes with each class being charged a specific accident levy. An experience rating system was also introduced so that employers are charged an additional levy, or given a rebate, based on their past accident claim history which is compared with their class average.

The HSE Act requires the employer to provide a safe work environment and minimise the risk of employees having work-related accidents. To encourage a safety management system at work, the Act permits fines of up to NZ$ 100,000 and/or one year imprisonment to be imposed on employers who fail to abide by the Act. If an accident occurs, it does not matter if the employer did not know of the hazard, the fact that an accident did occur means that the employer could be prosecuted. To avoid conviction, the employer must prove that all practical steps were taken to control all significant hazards.

These Acts have important implications for the forest industry as it must now provide a safe work environment and take all practical steps to eliminate significant hazards, or receive possible fines and increased levies. This will be difficult to achieve in an environment comprising of steep rugged terrain, undergrowth, falling trees, rolling logs, broken branches, and heavy machinery. Poor ergonomic conditions that include continual loud noise, vibration, fumes, and bad work posture, as well as weather conditions which range from below freezing to extremely hot, add to the hazards faced by the workers.

Due to the high number of significant hazards in New Zealand forests, the only plausible method of eliminating or isolating many hazards is through mechanisation of forestry operations. Mechanised harvesting removes the majority of dangerous hazards by placing the worker in a cab, but a variety of problems have made mechanised harvesting an unpopular option in New Zealand.

Mechanisation is extremely difficult in the steep terrain that is found in many New Zealand operations. Another problem is the general trend toward reducing the number of trees per hectare to the final stocking rate as early as possible. This practice results in trees with large diameters and very heavy branching which are unsuitable for mechanised harvesters (Gaskin, 1990). This means that motor-manual systems, involving workers using a chainsaw, must continue to be used for the felling and delimbing tasks which currently account for 55% of lost-time injuries (Gaskin & Parker, 1993).

The New Zealand forest industry must find other means of reducing or controlling the hazards workers must face. This is presently being addressed through training and research. The Logging and Forestry Industry Training Board (L&FITB) is developing and implementing Forest Industry Record of Skill (FIRS) training modules to improve working techniques and enhance the safety behaviour of forestry workers. Research examining ergonomics and occupational safety and health in forestry is being undertaken by the New Zealand Logging Industry Research Organisation (LIRO). Research projects have focused on reducing the physiological workload placed on forestry workers, the ergonomic evaluation of machinery, the effectiveness of protective footwear, the development of chainsaw trousers and high visibility clothing. LIRO also maintains an accident reporting scheme (ARS) for the industry.

LIRO's research efforts have had a notable effect on safety. For example, Gaskin and Parker (1993) reported that the severity of chainsaw lacerations has been reduced since the introduction of chainsaw chaps. However, improving safety through job and equipment redesign does have its limitations (Dwyer, 1992). Snook (1978) estimated that job redesign can eliminate 33% of manual handling errors, which still leaves 67% of errors unaccounted for. Near-miss accident reporting schemes also have limited effectiveness in reducing accidents. Guastello (1993) examined two near-

miss accident reporting programmes and found they had no effect on the accident rate, although one programme did reduce the severity of injuries.

It appears that further research examining other possible interventions is required if any substantial impact on the accident rate in forestry is to be achieved. Two areas that currently receive very little attention are the psychological aspects of forestry work and the psychological characteristics of the work-force (Slappendel, Laird, Kawachi, Marshall, & Cryer, 1993). The only psychological area that has been examined in detail is workers' perceptions of risk (Dunn, 1972; Ostberg, 1980; Tapp, Gaskin, & Wallace, 1990). Dunn (1972) suggested that some accidents occur due to workers underestimating the risk involved with some aspects of their jobs. In New Zealand, Tapp *et al.* (1990) found that loggers did know which aspects of their jobs were the most dangerous, and which part of their body was most likely to be injured. This raised the question, why do loggers take risks?

An answer to this question may be found by examining the attitudes of the personnel who work in the forest industry. A vast amount of safety research has been devoted to understanding and changing attitudes (Farmer & Chambers, 1939; Griffeth & Rogers, 1978; Zohar, 1980; Murphy, 1981; DeBobes, 1986). Early studies of safety attitudes concentrated on trying to identify accident prone individuals. Worick (1978, cited in Murphy, 1981) stated that faulty habits and attitudes are the prime accident producers. It was assumed that attitudes were strongly linked with behaviour, therefore changing attitudes would lead to a change in behaviour. This assumption, along with the concept of accident proneness soon became very popular, despite little empirical support (Hale & Glendon, 1987).

However, research in social psychology showed that attitudes were not strongly linked with behaviour (LaPiere, 1934; Wicker, 1969). Howarth (1988) noted that attitudes are often easier to change than behaviour, and a change in attitude does not always reflect a change in behaviour. Furthermore, researchers began criticising the large number of safety programmes that were based upon changing attitudes, as these programmes often had little success at reducing accidents or improving safety (Murphy, 1981; Sutherland, Makin, Phillips & Cooper, 1993; Guastello, 1993).

Recently, interest in an organisational safety "climate" or "culture" has caused a renewed interest in employees' attitudes towards safety (Cox &

Cox, 1991). Rather than concentrate on attitudes as a means of identifying accident prone individuals, attitudes are seen as a way of understanding the safety climate of an organisation (Zohar, 1980; Cox & Cox, 1991; Dedobbeleer & Béland, 1991). Studies examining attitudes towards safety have also provided valuable information for improving personal protective equipment (Allegrante, Mortimer, & O'Rourke, 1980; Feeney, 1986) and implementing successful safety systems (Smith, Cohen, Cohen, & Cleveland, 1978; Griffiths, 1985; Stoley, 1993).

Currently, the New Zealand forest industry has little knowledge of its safety climate, or the psychological characteristics of their work-force. To address this lack of knowledge, this study was undertaken to examine the attitudes towards safety held by members of the New Zealand forest industry. As both safety and attitudes are highly complex concepts, Purdham's (1984, cited in Cox & Cox, 1991) framework is used. Purdham divided attitudes towards safety into four different object areas: safety hardware (work environment and protective equipment), safety software (safety policies and concepts), people, and risk. These four object areas, and attitudes towards accident investigations are examined in detail. The final goal is to provide information that will help companies implement effective safety systems aimed at changing attitudes, behaviour, and ultimately, reducing accidents.

This study has been organised in the following manner. Chapter 2 summarises the contemporary psychological literature on attitudes, and explains how they are developed, maintained and changed. The relationship between behaviour and attitudes is described, followed by a brief discussion on attitude measurement.

Key research on attitudes towards safety and the psychological factors associated with these attitudes are described in Chapter 3. Literature examining safety hardware, software, risk and people is reviewed, and research regarding how safety can be improved is presented.

The research design is described in Chapter 4. Objectives and hypotheses are presented, followed by the procedures involved in developing a suitable questionnaire. Sampling and analytic strategies are also discussed.

Results from the survey are presented in Chapter 5, with the aid of tables. Firstly, the demographic data are summarised followed by results for

individual attitude questions. Results from the factor analysis and the construction of attitude scales are then presented. The differences between various groups are tested for significance using *t* -tests, chi-square, and one-way ANOVAs.

Chapter 6 discusses the implications of the results in relation to the four object areas of safety. The relationship between demographic variables, attitudes, and accidents is then discussed. Attitudes towards accident investigation procedures are examined in the final section. A number of problems are identified and discussed including attribution errors, and the psychological aspects of the work which must be taken into account when investigating accidents.

The final chapter summarises the forest industry members' attitudes towards safety. A safety strategy is described which should help improve the problem areas identified in this study. This is followed by some recommendations for future research.