Journal of Science, Technology, and Humanities : January - December 2007, Vol. 5, No. 1-2, pp. 29-34

EFFECTIVENESS OF CHEMICAL PREVENTION TRAINING PROGRAM FOR THE IMPROVEMENT OF KNOWLEDGE, ATTITUDES, AND WORK PRACTICE AMONG AUTO PARTS WORKERS IN THAILAND

Anamai (Thiravirojana) Thetkathuek[1]*, Tanongsak Yingratanasuk[1], and Phayong Thepaksorn[2], [3]

1. Department of Industrial Hygiene and Safety, Faculty of Public Health, Burapha University, Bangsaen, Chonburi 20131, Thailand.
2. Department of Environmental and Occupational Health Sciences, School of Public Health and Community Medicine, University of Washington, Seattle, Washington, USA 98195-7234
3. Sirindhorn College of Public Health, Trang 92000, Thailand

ABSTRACT

This study examined the effectiveness of a training program that aimed to change the knowledge, attitudes, and work practice of occupational safety related to chemical hazard of factory workers in Chonburi province, Thailand. A preliminary survey was conducted to identify training needs. Using these survey results, a training module was developed to teach topics in which workers had deficient knowledge. The module consisted of classroom lectures and demonstrations. Knowledge, attitude, and work practice were measured by a questionnaire constructed by the authors. Sixty subjects were recruited to participate in the training program as a control group and sixty as an experimental group. Both groups of subjects answered the questionnaire three times; before, one day after, and one month after the training. The results of the study revealed that knowledge, attitudes, and work practice of the participants before and after the training were significantly different ($P<0.05$). However, there was no difference between scores one day after, and one month after the training. The authors suggest that work practices should be monitored regularly to determine when re-training or further training is needed.

Keywords: Chemical training, auto parts, effectiveness of improvement.

INTRODUCTION

Thailand is often referred to, in recent years, as the "Detroit of Asia". Automobile, motorbikes, spare parts and items for sale in the auto market are made by numerous factories throughout Thailand. In terms of value, the auto industry is the number one manufacturing industry in Thailand, followed by Hard Disk Drive manufacture. The Thai government's policy, as well as recent acceleration of trade preferences, provides favorable conditions so much so that the economies of scale and efficiencies of the Thai auto and parts industry are magnifying Thailand's advantages in this area. (Thailand Automotive Institute, 2007).

* Corresponding author: Email address: anamai@buu.ac.th, anamaitt@hotmail.com, anamaitt@yahoo.com

Chonburi province is one of Thailand's major auto and parts industry. The high growth rate of this industry has resulted in an increasing number of employees in this industry each year In general, industrial employees are at risk of occupational exposure to several chemical hazards.

Training is one of the strategies to enhance and control unsafe factors, especially working with hazardous chemicals. Employees need to know about safety information related to chemical toxicities in the workplaces. In the United States, training guidelines for occupational health and safety consist of problem analysis, topics and training methods, training objectives, training programs, training and evaluation and development programs. For example, the safety management program for hazardous chemicals (title 29 Code of Federal Regulations Part 1910.119) contains several training requirements. This standard was adopted under the requirements of the Clean Air Act Amendments of 1990. This standard requires employers to evaluate or verify that employees comprehend the training given to them (Occupational Safety and Health Administration, 1998).

In Thailand, the law regulating occupational health and safety requires employers to prepare a training program related to chemical hazards for all employees. The objectives of the training program are to understand production process, stock, delivery of toxic chemicals, control and abatement, and release employees from unsafe situations. In addition, first aid is also required for employees.

In this study, the researchers anticipated that the occupational and safety training for chemical hazards is a crucial element of work safety for employees in auto parts companies. In addition, the regulations mandate employers to take action following the safety guidelines. The researchers in this study developed a program about chemical safety in auto parts companies and tested the effectiveness of this program. The main objectives of this training program include improving occupational health and safety of employees, by addressing employee knowledge, skill, and attitude. In addition, the researchers compared the effectiveness of this program to behavioral change, knowledge, and attitudes of employees in auto parts companies. In the future, this program will be used as a model to develop further programs to protect employees' health.

METHODOLOGY

This study is a quasi-experimental study.

Population

We recruited employees from one of auto parts companies in Chonburi province with specific selection and divided them into two groups between treatment group, which received the training program and control group, which did not receive the training program. The treatment group participated in the program of study designed by the authors, but the control group did not. Both groups had never participated in any training program related to occupational safety related to chemical hazard.

Data Collection

The data were comprised of three types. The first test determined the training needs of the participants. Before attending the training program, they answered a questionnaire about training history, frequency of training, and training needed topics. The second test surveyed the general background of employees, such as age, gender, job specification, and duration of work. The last test evaluated the knowledge, skill, and attitude of the participants. We administered the last test to both groups before training, one day after training, and one month after training.

Validity

The expert committees in terms of structure, validity, validated the questionnaires. The experts were comprised of educators specializing in learning ability and in occupational and safety training. Then, the researchers revised the questionnaires in terms of structural validity.

Experimental process

The researchers sent letters requesting the cooperation to the auto parts company. First, we evaluated the training needs for its employees. Second, we conducted a walk-through survey in the company to examine its occupational safety. We met and interviewed supervisors at the line production areas, and then we determined the training topics. Next, we implemented the training programs in occupational safety related to chemical hazard. Afterwards, we interviewed and tested the employees with a pretest and a post-test to evaluate knowledge, skill, and attitude. Finally, we assessed the effectiveness of this program both immediately after training and one month later.

Data analysis

This study analyzed the data by using SPSS/PC. The data analysis approach was repeated measures ANOVA with between-subjects factors. The first between-subjects factors were analyzed using a one-way ANOVA test which compared the effect of the training on the group receiving the training with the control group that did not receive the training (Table 1). This test measured the effect of having the training versus not having the training on the employee knowledge, skill, and attitudes. Next, a repeated measures ANOVA test was used to compare the effect of the training on participants in the group which had received the training at different time intervals, including before, one day after the training, and one month after the training (Table 2). This test measured how the effectiveness of the training may be affected by the amount of time elapsed after the training.

RESULTS

The results are presented in three sections: general background, evaluation of training needs, and comparing of the means of variables.

First, demographics information of the study participants showed that most of the employees were women (58.3%). The range of age was 25-32 years old with the mean age 26.77 years old. Fifty seven percent of the participants were married. The marital status was 57.3%. Most participants had completed high school (80%), received an average salary of 4,900-7,000 baht per month (60%) and had worked in the company participating in the study for 1-3 years (66%).

Second, to evaluate training needs, a total of 282 employees were interviewed on several topics, such as, training opportunities, training history, the frequency of trainings, and topics that need for future training, etc. The topics for training of employees with the advicse of safety engineers for training topics and the walked through survey results were concluded and summarized. The results showed that particular topics of interest for employees were chemical hazards and prevention program. In addition, the employees determined that fumes and airborne contaminants in the plant at production areas were found at intermediate moderate to high levels. Employees also understood the sign of chemicals, self-healthcare, and diseases at intermediate moderate level. For physical examinations, we found 163 cases of eye irritation (58%), 147 cases of nose and throat irritation (52%), 92 cases of dyspneaaptness (33%), 89 cases of running nose (32%), 161 cases of headache (57%), 112 cases of anxiety (40%), 43 cases of nausea and vomiting (15%), 79 cases of skin irritation (28%) and 68 cases of hearing disorders (24%). TAfter that, the research team discussed the preceding data with the safety engineers and the trainers of the company. We concluded that the employees should have training programs related to chemical hazards and protection. The training would bes comprised of lectureing and demonstration for three-hour periods.

Third, the questionnaire results showed the employees understanding of the factors of work practice, knowledge, and attitudes in the group receiving the training, as compared to the control groups that did not receive the training, b were significantly different ($\alpha < 0.05$) (See Table 1).

Fourth, we found that the employees understanding of some of knowledge, skill, and attitudes were significantly different ($\alpha < 0.05$) when measured before training, one day after, and one month after the training (See Table 2).

Table 1. Comparison of the means of knowledge, attitudes, and work practice between the experimental group and the control group using one-way ANOVA test.

Factor	Sum of square	df	Mean square	F	P-value
Knowledge					
Training	416.700	2	208.350	55.614	0.000*
Error	663.100	177	3.746		
Attitude					
Training	5037.744	2	2518.872	54.909	0.000*
Error	8119.650	177	45.874		
Work practice					
Training	28218.01	2	141090.006	173.003	0.000*
Error	14434.98	177	81.554		

* $p < 0.05$ is considered statistically significant.

Table 2. Comparison of the means of knowledge, attitudes, and work practice before, one day after, and one month after training of the group receiving training according to repeated measures ANOVA test.

Area of training	Independent variable	Dependent variable	Mean	P-value
Knowledge	Before training	One day after training	0.31912	0.000*
		One month after training	0.36986	0.000*
	One day after training	One month after training	0.36986	0.969
Attitude	Before training	One day after training	11.5333	0.000*
		One month after training	10.8833	0.000*
	One day after training	One month after training	0.6500	0.859
Work practice	Before training	One day after training	25.3167	0.000*
		One month after training	27.6500	0.000*
	One day after training	One month after training	2.3333	0.494

* $p < 0.05$ considered statistically significant

DISCUSSION

From the training program of occupational health and safety related to chemical hazards and changes in knowledge, skills, and attitudes, the researchers' team minimized and controlled the variables between cases and control groups. For example, all employees had similar knowledge, attitude, and practice related to chemical hazards. In addition, the post-tests were done right after training and one month later. The present study showed that the employees had significant differences in terms of knowledge, skills and attitudes between both groups before training, after training and one month after training ($p < 0.0001$).

Comparing the differences of knowledge, skills, and attitudes before, one day after training, and one month after training, we found that all variables were significantly different ($p < 0.0001$). However, the variables between after one day training and after one month training had no significant differences ($p>0.05$). The present study's findings were similar to those of Becker and Morawitz (2004). The employees who gained knowledge and skills after training improved their productivities. In addition, Hong et al. (2004) conducted an experiment concerning occupational safety in the petrochemical industry, and found that workers had more concerns about chemical hazards and toxicity. Moreover, their training program improved concerns and attitudes of both supervisors and employees. Szudy et al. (2003) also developed a similar training program, and found that after two years evaluation, employees had higher productivity than before training in health safety and working conditions.

Furthermore, the present study's findings were similar to those of Harrington and Walker (2004) in relation to ergonomics and safety. Of 48% of employees who had physical pain before training, after they applied training knowledge, they had decreased and recovered from their physical pain. Therefore, training program is one of the important practices for employees to improve their concerns and behavioral changes. It also reduces occupational accidents and injuries.

In the present study, we found employees had significantly improved their knowledge after training ($p<0.05$). This training program showed a result relevant to the study of Porru et al. (1993) in the lead industry. They found significantly decreased blood lead levels in employees after training. In addition, the present study confirmed that of Cotterchio et al. (1998) in that safety practice came from good knowledge of the training. Szudy et al. (2003) also found training program improved occupational health and safety.

We found the significant improving of employees' attitudes in using toxic chemicals after training. This training affects both cognition and attitude of employees. Hong et al. (2004) reported that safety training group in petrochemical company showed more positive attitudes than the group without training. In addition, this study found the results similar to those of Cotterchio et al. (1998). The employees who had been trained had more concerns than those who were not related to safety working.
The employees who had been trained about toxic chemicals and safety had good attitudes and knowledge. The present study found significant changes before and after training that was similar to those of the study of Mukherjee et al. (2000). They found that the training program related to health and safety improved health behaviors of their employees. In addition, Finch and Daniel (2005) found that employees changed their behaviors after the training. Similarly, Burk et al. (2006) found that training improved good practices and decreased occupational injuries when the employees have shared their knowledge and attitudes. Suwan (1993) found that training program improved employees' knowledge, attitude and concerns about health and safety of toxic chemicals.

The present study found that when employees gained their knowledge and did good practices, they would improve their work, changed their behavior, and increased concerns about toxic chemicals. This training program had benefits to employees and also improved their quality of life. For a future study, we suggest that researchers should assess problems in the

factory and find training needs of employees in terms of knowledge, skills, and attitudes before and after training. Since these changes are not stable, the refreshment program should be concluded. The duration after training also influences the decrease in knowledge. In addition, it should compare the differences of the training program methods, such as using video, charts, or other visuals, etc.

REFERENCES

Becker, P. and Morawetz, J. 2004. Impacts of health and safety education; comparison of worker activities before and after training. *American Journal of Industrial Medicine* 46(1): 63-70.

Burke, M. J., Sarpy, S. A., Smith-Crowe, K., Chan-Serafin, S., Salvador, R. O., and Islam G. 2006. Relative effectiveness of worker safety and health training methods. *American Journal of Public Health* 96 (2):315-24.

Cotterchio, M.; Gunn, J.; Coffill, T.; Tormey, P., and Barry, M. 1998. Effect of a manager training program on sanitary conditions in restaurants. *Public Health Report* 113(4):353-8.

Finch, C., and Daniel, E. 2005. Food safety knowledge and behavior of emergency food relief organization workers: effects of food safety training intervention. *Journal of Environmental Health* 67(9): 30-34.

Harrington, S. and Walker, B. L. 2004. The effects of ergonomics training on the knowledge, attitudes, and practices of teleworkers. *Journal of Safety Research* 35(1): 13-22.

Hong, Y. J., Lin, Y. H., Pai, H. H., Lai, Y. C., and Lee, I. N. 2004. Developing a safety and Health training model for petrochemical workers. *Kaohsiung Journal of Medical Sciences* 20(2): 56-62.

Mukherjee, S., Overman, L., Leviton, L., and Hilyer, B. 2000. Evaluation of worker safety and health training. *American Journal of Industrial Medicine* 38(2): 155-163.

Occupational Safety and Health Administration. 1998. Training Requirement in OSHA Standards and Training Guidelines. OSHA 2254 (Revised), USA. Available on: http://www.osha.gov/publications/osha 2254.pdf

Porru, S., Donato, F., Apostoli, P., Coniglio, L., Duca , P., and Alessio, L. 1993. The utility Of health education among lead workers: the experience of one program. *American Journal of Industrial Medicine* 23(3):473- 81.

Suwan, P. 1993. *Behavioral Health Sciences and Health Education.* Faculty of Public Health, Mahidol University, Bangkok, Thailand (Book in Thai).

Szudy, B., O'Rourke, D., and Brown, G. D. 2003. Developing an action-based health and safety training project in southern China. *International Journal of Occupational and Environmental Health* 9(4): 357-367.

Thailand Automotive Institute. 2005. APEC-Bangkok Declaration. Available on: http://www.thaiauto.or.th/About_Us/annual_eng_2005.pdf: retrieved on May 2007.