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## COMPLIANCE WITH SAFETY BEHAVIOR AMONG INDUSTRIAL WORKERS: ANY EFFECTS OF TRAINING AND LEVEL OF EDUCATION?

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**Abstract:** This study examined the effects of training and level of education on compliance with safety behavior among industrial workers. Thirty two participants comprising 16 trained and 16 untrained industrial workers between the ages of 24 to 52 years ( $M = 38.41$ ,  $SD = 6.19$  years) were systematically sampled. Occupational Safety and Health Administration (OSHA) (1998) training manual and Geller (1998) Behavior-Based- Safety (BBS) training guideline were used for the training (treatment). Safety Behavior Compliance Checklist was used for data collection. A Two-Way randomized between-groups factorial design was used while a Two-Way ANOVA  $F$ -test was applied as a statistical test for data analysis. The results revealed that training yielded a significant effect on compliance with safety behavior among industrial workers,  $F(1, 28) = 21.92$ ,  $p < .05$  level of significance while level of education yielded no significant effect on compliance with safety behavior among industrial workers,  $F(1, 28) = .056$ ,  $p > .05$  level of significance. These outcomes were discussed in the light of the practical effectiveness of safety training using behavior-based safety approach. Considering the outcomes of this study, it was concluded that safety training is one of the best approaches to effect behavioral changes in the workplace. Thus, it was recommended that employers of labor should engage in safety training of their workers in order to maximize the benefits therein. The findings also have practical implications for identifying safety training as an effective mechanism for cultivating safety behaviors in the workplace via compliance.

**Keywords:** Compliance, Safety Behavior, Training, Level of Education, Industrial Workers

### INTRODUCTION

Despite the efforts by industrial/organizational psychologists, public administrators, business managers, experts from engineering and related fields to improve work safety, industrial accidents remain major concern as shown by statistics (Loughlin, Hapburn & Barling, 1995) with close to three people dying and over 170 people sustaining a disabling injury every 10 minutes (National Safety Council, 1999). According to Ajakaye (2010), a total sum of 47, 832, 536 and 40, 836, 676 claims were paid as workmen's compensation and employers' liability by the insurance companies in Nigeria in 1997 and 1998 respectively with greater percentage of the compensation on work related death and illness of factory workers (Ajakaye, 2010). Health and Safety Executive figures show that 36 million days (1.5 days per worker) were lost overall as a result of workplace injuries and ill health during 2005/06, 30 million were due to work-related ill health and 6 million due to workplace injury (Health and Safety Commission, 2007). Occupational accidents are rising due to lack of attention given to safety compliance, safety procedures and improvement of methods to prevent accidents and injuries (Jiang, Yu, Li, & Li, 2010). Occupational accidents also occur due to lack of knowledge, training, lack of supervision, and lack of rules implementation. In addition, human error leads to negligence, carelessness of workers, recklessness of workers and lack of monitoring and controlling. All these factors have influence on safety behavior compliance or lead to the weakening of safety compliance and the high rate of accidents (Tharaldsen, Mearns, & Knudsen, 2010). Safety

climate is considered a subset of organizational climate and refers to the coherent set of perceptions and expectations that workers have regarding safety in their organizations (Neal, Griffin, & Hart, 2000, Cooper, & Phillips, 2003, Zohar, 2000). Workers' perceptions of safety climate have been regarded as a principal guide to safety compliance, as measuring the precursors of accidents identified in a safety climate analysis, has provided compelling proactive accident management tools. Thus, safety behavior as conceptualized in this study encompasses all the activities undertaken by individuals in their workplace to ensure their personal safety, the safety of their co-workers and the safety of their organization at large. Safety behavior activities include the use of personal protective equipments, engagement in workplace practices to reduce risk, dissemination or communication of health and safety information, exercise of their rights and responsibilities (Burke, Sarpy, Tesluk, & Smith-Crowe, 2002), safety compliance and safety participation (Marchand, Simard, Carpentier-Roy, & Ouellet, Neal et al ,2000). Safety compliance refers to the mandatory activities that workers need to perform to bring about workplace safety while safety participation on the other hand, involves activities that may not directly contribute to an individual's personal safety, but which do help to develop an environment that supports safety (Neal & Griffin, 2002). In all, workers' safety oriented behavior can be scaled by the extent to which they engage in actions that promote safety and avoid those that decrease safety (Ford & Tetrick, 2008), hence the need for safety training.

Safety training is a key element in the prevention of work-related injuries, illnesses and death. When educated on safety procedures, employees will know how to prevent an incident in the workplace by properly operating machinery and handling tools, and will also learn how to respond quickly if presented with a dangerous situation. Training refers to conditions in which people can learn effectively, gain knowledge, skill and ability (King, 1968). Training, therefore, is the systematic acquisitions of skills, rules, concepts, or attitudes that result in improved performance (Goldstein & Ford, 2002). Employee safety should be a high priority in any workplace, whether it is an office or a factory. Workers' safety training is important since studies (e.g. Isah, Asuzu & Okojie, 1996, Hu, Lee, Shiao & Guo, 1998, Bazas, 2001, Nasab, Ghofranipour, Kazemnejad, Khavanin & Tavakoli, 2008, International Labor Organization, 2011) have shown that the high vulnerability of workers to occupational health hazards is due largely to insufficient knowledge on how to manage the risks at workplace and the unsafe behavior of both employees and employers. And workers who do not undertake occupational safety training/education programmes were five folds more likely to encounter occupational injuries and diseases than those who undertook the programmes (Hu *et al.*, 1998). Moreover, education helps to provide the appropriate skills needed to achieve social status and make healthy lifestyle choices (Graham, 2004). Despite Nigeria being a country where essential and accurate statistics is hard to come by, one cannot but notice the countless numbers of untimely but avoidable deaths and bodily injuries that have plagued our society over the years (Ogunmosunle, 2012). The issue of safety and health at workplace which once occupy a major place in the programme and plan of employers is now treated with levity. Within the context of Nigeria organizational plan, the issues of safety are now considered non-essential in operational plans because it is viewed as consequential to profit margin and thus overhead cost resulting from provisions for safety is grossly cut down (Ogunmosunle, 2012). In Nigeria, the practice in some manufacturing and industrial organizations is that workers learn knowledge and skills regarding occupational health and safety informally from co-workers and employers, which implies that workers may not be well informed on how to manage the risks at workplace (Isah *et al.*, 1996). The inference can, therefore be made that aside the fact that preventive measure may not be in place in some organizations, in some other organizations where they are

provided, workers are not well informed, through safety training programmes, of the usage of the preventive measures resulting in little or no safety training in the workplace (Bazas, 2001), hence the need for this present study on effects of training and level of education on compliance with safety behaviors among industrial workers.

## **RELATED LITERATURE**

Cooper (1998) used Domino theory of accident causation to explain the influence of management control on safety behaviours. This theory is of the view that poor management control creates either poor personal factors (e.g. lack of appropriate training) or poor job factors (e.g. unguarded machinery). In combination, these two factors lead to either unsafe acts or unsafe conditions. These could cause incidents that lead to losses related to people, property, or production processes, thus the need for training which enhances compliance resulting workplace safety behavior. In addition studies (e.g. Arthur, Bennett, Edens, & Bell, 2003) using meta-analytic procedures observed that the training method used, the skill or task characteristic trained, and the choice of evaluation criteria were related to the effectiveness of training programs and enhanced the effects of training on safety behavior (Cavazza & Serpe, 2010). Regarding more specific training, Cabrera (1998) found that participation in safety training produces a positive attitude toward safety and a significant relationship between employees' safe behavior and both the climate of safety and attitudes toward safety. Other studies (e.g. Morrow, McGonagle, Dove-Steinkamp, Walker, Marmet & Barnes-Farrell, 2010, Wills, Watson, & Biggs, 2006, Clarke, 2006) have however reported a significant positive relationship between safety climate and safety compliance. Safety climate has also been reported to correlate negatively with safety outcomes like accident and injury rates (Clarke, 2006, Johnson, 2007, Zohar, 2000, Hoffman & Stretzer, 1996). Demographic factors such as level of education, type of employment, and gender were some of the commonly concerned demographic factors influencing safety behavior (Parker, Brosseau, Samant, Pan, Xi, & Haugan 2007, Seixas, Blecker, Camp, & Neitzel 2008; Carpenter, Lee, Gunderson, & Stueland, 2002) and safety in the workplace (Graham, 2004). The available empirical studies have shown that researches in this area were carried out in the Western countries. Again, many of the researches were survey based and have other variables as their independent variables, thus, the need to close the gap by investigating the effect of training and level of education on compliance with safety behavior among a sample of Nigerian industrial workers.

## **METHOD**

### **Participants**

A total of 32 participants comprising 16 trained and 16 untrained industrial workers between the ages of 24 to 52 years ( $M = 38.41$ ,  $SD = 6.19$  years) were randomly (systematically) drawn from a population of industrial workers in Scientific Equipment Development Institute (SEDI), Enugu and randomly (odd and even technique) assigned into 6 trained industrial workers with high education and 10 trained industrial workers with low education against 7 untrained industrial workers with high education and 9 untrained industrial workers with low education.

## **INSTRUMENT**

The following instruments were used for the study:

1. Training Manual Guide adopted from the U.S. Department of Labor Occupational Safety and Health Administration (OSHA 2254) 1998 (Revised). This manual comprised a standard voluntary guideline to be used while embarking on safety training. Also, Behavior-Based- Safety (BBS) training guideline by Geller (1998) was adopted. BBS is a

step-by-step application of behavioral safety guideline on the use of Personal Protective Equipment (PPE) in the industrial setting.

2. A Lap Top Computer for simulation of industrial accident images to the trainees and presentation of training materials.
3. List of safety gadgets (Personal Protective Equipment) as well as physical presentation and training on their uses, importance, and safety function of each. The following are the required safety wears to be worn before embarking on the job; overall, safety boot, safety goggles, hand gloves, ear muffler, dust mask, safety drinks.
4. Safety Behavior Compliance Checklist. This is compliance with safety behavior checklist to be completed by the researcher as he observes safety behaviors of the participants in the workplace. The checklist contains a list of PPE and other safety behaviors that needed to be observed.

**Scoring:** Each participant scored 1 point on complying with a given safety behavior and 1 point on non compliance with a safety behavior.

**Norms:** Scores between 0 - 50 = low or noncompliance with safety behavior.

50 - 100 = average/adequate compliance with safety behavior.

**Validity:** The safety behavior coding sheet was exposed to face validity in which 5 heads of section consented that the checklist is measuring what it supposes to measure.

**Pilot Study:** A pilot study was carried out using 10 participants. They were trained and observed within two days, and inter-rater/observer reliability on the compliance with safety behavior checklist yielded a Kappa coefficient of .52.

**Reliability in Behavior Observation:** In behavioral observation sampling error must be considered (Kaplan, 1993) hence the need to assess the reliability of the observer (Cordes, 1994). For this study inter- observer reliability (Coolican, 2009) was adopted and Kappa statistics was applied in establishing the reliability scores. Kappa statistics is the best method for assessing the level of agreement among several observers (Cohen, 1960; Fleis, 1971; Kaplan & Saccuzo, 2005). However, inter - observer reliability for this study yielded a Kappa coefficient of .76. In comparison with Landis and Koch (1977) interpretation, Kappa values are as follows:  $<.40$  = poor,  $\geq .40$  to  $< .75$  = fair to good and  $\geq .75$  = excellent. Hence, this observation was highly reliable.

5. A placebo treatment: This was an extract of seminar paper from the researchers previous work titled (Introducing Work Teams in Organizations: Organizational Behavioral Implications). This was used in training the participants in the control group.
6. Stop watch: this was used for keeping and maintaining time for the training durations for the two groups. Name of device: Nokia 2730 application version of the stop watch.

## Procedure

A permission letter was written to the management of the institution; upon approval the researchers were formally introduced to the different sections in the organization within 2 weeks by a supervisor who was assigned to guide them. The researchers based on observation, identified the need for safety training in order to augment the compliance with safety behaviors of workers. The researchers briefed the Heads of sections (machine shop and machine building) about the safety training and subsequent research that will follow. The supervisor was duly trained by the researchers to serve as a research assistant and inter-observer for the study. The register was used to know the staff strength of the workplace which helped in planning the experiment, every 4<sup>th</sup> term was randomly selected and randomly assigned using odd and even technique to a treatment group. The training sections (treatment) lasted for 30 minutes each for the two groups and randomized control design (Jadad & Enkin, 2007) was used in controlling

the treatment groups. The observation of the participants' behavior to know the effect of the independent variables on the dependent variable lasted for 2 weeks. Scores were obtained and subjected for analysis in testing the hypotheses. Finally, a debriefing was carried out on the participants since they were not aware of the purposes of the training and the experiment in general because the researchers adopted a non-disclosed technique, the essence was to allow the behaviors of the participants occur naturally and to reduce or avoid demand characteristics. Subsequently, all the staff was trained on the need for safety behavior compliance in the workplace.

### Design/Statistics

The design for this study was two way randomized between-groups factorial design. Two-Way between groups ANOVA *F-test* for unequal sample (Coolican, 2009) was used as statistical test for data analysis.

## RESULTS

**Table 1: Summary Table of Means on the effect of Training and Level of Education on Compliance with Safety Behavior among industrial workers.**

*Dependent Variable: Compliance with Safety Behavior*

Training	Level of Education	Mean $\bar{x}$	N
Trained	High level of Education	73.83	6
	Low level of Education	77.10	10
	<b>Total</b>	<b><math>\bar{X} = 75.86</math></b>	<b>16</b>
Untrained	High level of Education	42.86	7
	Low level of Education	42.89	9
	<b>Total</b>	<b><math>\bar{X} = 42.88</math></b>	<b>16</b>
Total	High level of Education	57.15	13
	Low level of Education	60.89	19
	<b>Total</b>	<b><math>\bar{X} = 59.38</math></b>	<b>32</b>

The table of means above showed that trained participants obtained a total mean of 75.86 while untrained participants obtained a total of 42.88. Also, participants with high level of education obtained a total mean of 57.15 while those with low level of education obtained a total mean of 60.89. Trained participants with low level of education obtained the highest group mean of 77.10 followed by trained participants with high level of education (73.83) and untrained participants with low level of education (42.89) while untrained participants with high level of education obtained the lowest mean of (42.86). Thus, a high mean indicated average/adequate compliance with safety behavior while a low mean indicated non/poor compliance with safety behavior. Therefore, trained participants displayed higher compliance with safety behavior unlike the untrained participants that exhibited poor compliance with safety behavior. Hence, they (the untrained participants) were at risk for workplace accidents due to non compliance with safety behavior while the trained participants showed that training is an effective means of preventing workplace accidents by complying with safety behavior. This showed a remarkable difference between trained and untrained industrial workers' compliance with safety behavior.

Table II: Summary table of Two - Way ANOVA on between-subjects effects of training and level of education on compliance with safety behavior among industrial workers.

*Dependent Variable: Compliance with Safety Behavior*

Source of Variance	Type III Sum of Squares	df	Mean Square	F	Sig.
Training	8161.927	1	8161.927	21.921	.001
Level of Education	20.897	1	20.897	.056	.814
Training * Level of Education	20.100	1	20.100	.054	.818
Error	10425.479	28	372.339		
Total	131990.000	32			
Corrected Total	19177.500	31			

- a. R Squared = .456 (Adjusted R Squared = .398)
- b. Computed using alpha = .05

From table II above, training had a significant effect on compliance with safety behavior  $F(1, 28) = 21.92, p < .05$ . This indicated that training as factor had a significant effect on compliance with safety behavior among industrial workers. Meaning that, industrial workers' compliance with safety behavior improved due to the training they received to that effect.

Also, from the same table II above, level of education had no significant effect on compliance with safety behavior  $F(1, 28) = .056, p > .05$ . This indicated that level of education as a factor had no significant effect on industrial workers compliance with safety behavior. Meaning that, compliance with safety behavior had nothing to do with the level of education of the industrial workers who served as the participants.

## DISCUSSION

The findings have indicated that training had significant effect on industrial worker's compliance with safety behavior. Training was found to be an effective tool in instilling compliance with safety behaviors among industrial workers. The findings of this study are in congruence with earlier findings (e.g. Arthur Jr, Bennett Jr, Edens, & Bell, 2003, Cavazza & Serpe, 2010) which demonstrated that training method used, the skill or task characteristics trained, and the choice of evaluation criteria were related to the effectiveness of training programmes. Safety training programmes are one of the tools provided for by law in order to promote workers' safe behaviors. This outcome also gives credence to Geller (1998) Behavior-Based-Safety theory which focuses on what people do, analyzes why they do it, and then applies a research supported intervention technique to improve behavioral problems. In this vein, employers have a responsibility to introduce practical steps in the workplace to protect their employees from aspects of the work environment that are detrimental to safety and health and that practical, hence Behavior-Based-Safety training programme. When a worker is being adequately trained on the safety measures he/she required to carry out a job, it will be difficult for accident to occur and will restore the confidence, satisfaction and productivity of both the employer and the employee. These findings also revealed that level of education as factor had no remarkable effect on compliance with safety behavior among workers. Meaning that industrial workers' compliance or non compliance with safety behaviors had nothing to do with

their educational level. This outcome is not in congruence with Graham (2004) study that education helps to provide the appropriate skills needed to achieve social status and make healthy lifestyle choices. This incongruence could be attributed to the fact that industrial workers in this part of the world irrespective of their educational background can do anything to earn a living because of the poor economic condition of the country and poor funding of training by employers. Thus, the workers due to lack of training and exposure to the right and compulsory safety behaviors wallow in ignorance of unsafe work behaviors, despite their high or low level of education.

## RECOMMENDATIONS AND CONCLUSION

The findings of this study have shown theoretical and practical implications by identifying and demonstrating that compliance with safety behavior among industrial workers could be achieved through training (Behavior-Based-Safety), hence the following recommendations:

- In order to achieve general work safety management in Nigerian industries, it is necessary to modify workers safety behavior through multi-pronged programmes like the Behavior-Based-Safety training that combine interventions on behavioral change in the way industrial workers act in relation to safety. For instance to enhance compliance, a person-related approach like training workers' to perceive risk correctly should be complemented with a corresponding enhancement of organizational safety practices like safety inspection and monitoring.
- Employers should avail their employees the opportunity of safety training by designing one, inviting experts to conduct it for them, or sponsoring intending workers for safety training.
- Employers should incorporate new employees' safety training as part of the orientation process. Managers should also offer their employees periodic refresher courses in safety training. Since training is an effective way of reducing incidents and cost for the organization.

Finally, organizational factors related to safety and health at work, including management's policies and practices regarding occupational risk prevention, have been shown to affect implementation of workers' safety training. Organizations, therefore, should encourage safety behavior practices by making policies and regulations that will empower workers to attend, promote and comply with safety behaviors in the workplace.

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**Reference** to this paper should be made as follows: Okonkwo Ejike A., Okoro Chinwendu M., Nwandu Ikechukwu B. (2015), Compliance with Safety behavior among Industrial Workers: Any effects of Training and Level of Education? *J. of Sciences and Multidisciplinary Research*, Vol. 7, No. 1, Pp. 96 - 105.

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