

## Measuring the Safety Consciousness Level of Construction Workers based on Emotional Approach with a Particular Consideration of Safety Management of Construction

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**Abstract:** This study considered how to approach the safety consciousness levels of workers at construction sites. Despite, the many studies on how to improve safety on construction sites, the research in this area should be reoriented as construction accidents have only increased, so far. This means that a different approach should be taken at construction sites. Therefore, this study focused on improving worker's safety consciousness and encouraging their own spontaneous safe actions according to an emotional approach based on different aspects of previous attempts and results. The questionnaire in this survey was designed to consider several factors including: excavator bucket safety, 100% tie-off while working at height, touch-and-call, electrical inspection, lifting gear inspection, life lines on scaffolding using tag lines for lifting work and incidents caused either by the government/contractors or due to worker's fault. The questionnaire was prepared using a nut technique with contents related to incident prevention. The result of the questionnaire analysis related to the hooking of safety belts during hazardous operations at a height showed that the more workers wore safety belt rings, the more they wore two rather than one. As a result, worker's safety training is expected to be planned for groups that are not in a position to sue and those with <10 years of experience and safety education. The planning of joint training for lifting worker groups and electricians to ensure parallel cooperative safety is considered a rising factor to increase effectiveness. It is determined that lifting worker teams and scaffolding worker teams can be organized into customized cooperative safety training teams.

**Key words:** Safety consciousness, emotional approach, main contractor and subcontractor, spontaneous, emotional, scaffolding worker

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### INTRODUCTION

Although, construction contractors have made an effort to improve construction worker's safety awareness, the level of safety awareness has not improved as much as expected. An analysis of the level of safety awareness showed that the awareness level of project management teams was higher than that of workers (Kim, 2015). Moreover, the safety awareness of main contractors was better than that of subcontractors. The improvement of worker's safety awareness is a key preventive measure (Kim, 2015).

The importance of safety training to improve safety awareness has been continuously emphasized. However, the effectiveness of safety training to improve safety awareness has not been sufficiently communicated by safety professionals (Yoon and Yoo, 2016; Jin *et al.*, 2012). A study on safety training based on worker's characteristics and reflecting site conditions is in progress (Heo, 2015; Ko and Lee, 2018). Despite, the support from

governmental authorities and contractors and the provision of safety training and equipment, the rate of incidents has not been drastically reduced. Recently, project safety management has been complicated by the increase in Foreign workers on project sites. Based on the premise that incidents cannot be prevented by enforcing compliance with safety rules and regulations only, this study was written to consider survey questions designed to derive an emotional approach and promote safety awareness by presenting workers with some self-care factors.

To reduce the risk of errors, the survey was conducted on 123 construction workers working in 6 different local governments. It was carried out from June to October 2018.

### MATERIALS AND METHODS

**Survey planning:** The questionnaire in this survey was designed to consider several factors, including: excavator

Table 1: Survey planning

Questions	Descriptions
Q16	What do you think about no indication or an indication of “safety pin connection” when you work with a bucket-attaching excavator?
Q17	What do you think about connecting safety belts more tightly using two belts rather than just one while working at a height?
Q19	Do you think that performing the touch-and-call method can contribute to preventing accidents more than not performing it?
Q21	Do you think that checking electrical tools before work can contribute to preventing accidents more than not checking them?
Q22	Do you think that checking rigging work tools can contribute to preventing accidents more than not checking them?
Q24	Do you think that wearing a safety belt can contribute to preventing accidents more than not wearing one?
Q26	Do you think that wearing a hard hat with goggles can contribute to preventing accidents more than without goggles?
Q30	Do you think that installing a leading rope can contribute to preventing accidents more than not installing one?
Q32	What do you think about following the decisions of the government or the owner of the project with respect to accident safety?

Table 2: Frequency rate

Variables/categories	N	Percentage
<b>Major</b>		
Construction	32	26.0
Civil engineering	24	19.5
Electrical	19	15.4
Design	4	3.3
Safety	18	14.6
Other	26	21.1
<b>Career</b>		
<1 years	17	13.8
1-5 years	19	15.4
6-10 years	23	18.7
11-30 years	60	48.8
>30 years	4	3.3
<b>Employment type</b>		
Permanent employee	49	39.8
Contract worker	29	23.6
Recruitment	34	27.6
Other	11	8.9

Table 3: Average analysis

Items	Importance
Q16	3.95
Q17	3.89
Q19	3.95
Q21	4.23
Q22	4.26
Q24	4.38
Q26	3.84
Q28	3.63
Q30	4.28
Q32	4.11

bucket safety, 100% tie-off while working at height, touch-and-call, electrical inspection, lifting gear inspection, life lines on scaffolding using tag lines for lifting work and incidents caused either by the government/contractors or due to worker’s fault (Table 1).

**Selection of survey participants:** The questionnaire was prepared using a nut technique with contents related to incident prevention. We collected 143 out of the 150 survey sheets distributed to the participants. A total of 123 survey questionnaires were then selected after excluding 20 less-reliable ones.

The analysis performed in this study aimed to identify the effects of a sentimental approach in survey participants divided into more than 30 years and 6-19 years of experience (as workers with <5 years of work experience are considered to be very passive) (Table 2).

**Statistical methods:** The SPSS Version 23 program package was used to perform a frequency analysis, average analysis and correlation analysis to analyze the various aspects and derive scientific conclusions.

**RESULTS AND DISCUSSION**

Table 3 presents the average value for the 10 items according to the work experience. The average value was

over 3.8 and the level of safety awareness was evaluated as above the normal average. Maintaining work safety in the workplace is crucial at all times. Some factors were shown to have a significance level (Table 4). The above r-squares of 63.5 and 61.9% were analyzed as significant as shown in Table 4.

The result of the questionnaire analysis related to the hooking of safety belts during hazardous operations at a height showed that the more workers wore safety belt rings, the more they wore two rather than one.

Some respondents with 6-10 year’s experience and with 11-30 year’s experience were negative about the effect of the touch-and-call technique. However, workers with over 30 year’s experience were positively aware of its accident prevention effect as shown in Table 5-7.

Some of the respondents with 6-10 year’s experience thought that there was almost no accident prevention effect. Conversely, workers with over 30 year’s experience recognized that there was a considerable accident prevention effect as shown in Table 7.

**Analysis:** Regarding the belief in wearing more than one lanyard when working at a height, the average value was about 0.10 for workers with more than 30 years in the construction industry, compared with 4.04 for those with shorter careers in the industry.

Even if the difference between conducting a touch-and-call or not was a minor emotional consideration with regard to its effectiveness in preventing incidents, the average value for those with more than 30 years of experience was about 0.07, compared with 4.00 in the other respondents.

Table 4: Correlation analysis

Kind	Q16	Q17	Q19	Q21	Q22	Q24	Q26	Q28	Q30	Q32
Q16	1.0									
Q17	0.486**	1.0								
Q19	0.572**	0.426**	1.0							
Q21	0.562**	0.398**	0.529**	1.0						
Q22	0.634**	0.419**	0.555**	0.706**	1.0					
Q24	0.577**	0.424**	0.476**	0.619**	0.635**	1.0				
Q26	0.336**	0.324**	0.331**	0.241**	0.350**	0.259**	1.0			
Q28	0.216*	0.281**	0.268**	0.244**	0.210*	0.222*	0.355**	1.0		
Q30	0.506**	0.25**	0.395**	0.589**	0.529**	0.486**	0.304**	0.303**	1.0	
Q32	0.027	0.094	0.173	0.122	0.181*	0.232**	0.051	0.460**	0.284**	1.0

\*\*The correlation factor was considered satisfied at a significance level under 0.01

Table 5: Q17 frequency rate (career)

Values	Career 6-10 years		Career 11-30 years		Career >30 years	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
1	2	8.7	1	1.7	1	25.0
2	2	8.7	0	0.0	0	0.0
3	6	26.1	17	28.3	0	0.0
4	10	43.5	27	45.0	2	50.0
5	3	13.0	15	25.0	1	25.0
Total	23	100.0	60	100.0	4	100.0

Table 6: Q19 frequency rate (career)

Values	Career 6-10 years		Career 11-30 years		Career >30 years	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
1	0	0.0	0	0.0	0	0.0
2	2	8.7	1	1.7	0	0.0
3	8	34.8	15	25.0	0	0.0
4	9	39.1	28	46.7	2	50.0
5	4	17.4	16	26.7	2	50.0
Total	23	100.0	60	100.0	4	100.0

Table 7: Q21 frequency rate (career)

Values	Career 6-10 years		Career 11-30 years		Career >30 years	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
1	0	0.0	0	0.0	0	0.0
2	3	13.0	0	0.0	0	0.0
3	5	21.7	6	10.0	0	0.0
4	12	52.2	28	46.7	2	50.0
5	3	13.0	26	43.3	2	50.0
Total	23	100.0	60	100.0	4	100.0

The recognition that electrician’s inspection of their tools is effective in preventing incidents was 0.10 on average in those with more than 30 year’s experience, compared with 4.28 in others.

Regarding lifting and electrical safety, it was believed that the effectiveness of joint education of the two working groups could be increased during construction site safety training with a correlated R<sup>2</sup> of 70.8% for work safety training.

It was considered that lifting safety training should be carried out for scaffold work with an R<sup>2</sup> of 39.5% correlated with the implementation of safety education. Co-parallel training or a custom-divided safety training operation assistant arrangement could be considered.

**CONCLUSION**

Awareness of the need to wear field safety equipment is reduced in those with <10 years of experience on construction sites. Worker’s safety training is expected to be planned for groups that are not in a position to sue and those with <10 years of experience and safety education.

The planning of joint training for lifting worker groups and electricians to ensure parallel cooperative safety is considered a rising factor to increase effectiveness.

It is determined that lifting worker teams and scaffolding worker teams can be organized into customized cooperative safety training teams.

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