Development of a risk prediction training system and the applicability in safety management

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ABSTRACT

In the Japanese construction industry, serious accidents frequently occur. Although the industry tries to reduce risks of work itself and the work environment by risk assessment in advance, it is not enough to reduce risks because there are many risky jobs originally and new risks happening during work progress. Workers need to try hard to personally prevent accidents by taking safety training and receiving safety education. Therefore, we developed a risk prediction training tool with a tablet device and evaluated the effectiveness of a risk prediction training with the tool in two experiments. In addition, we made “a website for safety management” that managers can use to confirm and manage records about workers’ achievements in risk prediction training with the tool. Furthermore, we considered the applicability of a risk prediction training system that included a risk prediction training tool with a tablet device and a website for safety management in residential construction sites.

Keywords: safety training, effectiveness, construction worker

1. Introduction

In the Japanese construction industry, serious accidents frequently occur. 15,584 construction workers experienced absences of four days or more due to occupational accidents (13.4% of accidents in all industries) and 327 construction workers were killed (33.6% of accidents in all industries) in 2015 (Ministry of Health, Labour and Welfare, 2016). The industry tries to reduce risks of work itself and the work environment by risk assessment in advance. However, there are many risky jobs originally in construction sites, and new risks occur during work progress. Therefore, the risk assessment that managers conduct is not enough to reduce risks. Workers need to try hard to personally prevent accidents by taking safety training and receiving safety education. We focused on the residential construction industry, and were developing a risk prediction training tool for residential construction workers with a tablet device.

This paper introduces the development of the tool, the evaluation on the effectiveness of risk prediction training with the tool, and the applicability of a risk prediction training system that includes the tool in the safety management. Additionally, this paper was revised based on the article of JNIOSH News No. 96.

2. Risk prediction training tool

A structure of the tool is as follows (Figure 1): after an explanation of the working situation was presented on a tablet device, four images of a job were presented simultaneously. Of the four images, a risk factor was included in only one of the images. After confirming the working situation, a worker touched the image in which a risk factor was included. At this time, the answer and the explanation were presented, and reaction time and correctness were recorded automatically. By repeating this process, the worker learned the risk factors. In this study, four types of job in which work-related accidents frequently occur at residential construction sites were selected as the themes.
3. Effectiveness of the risk prediction tool

To study the effectiveness of risk prediction training with the tool, we conducted two experiments for residential construction workers. In the first experiment, 70 workers repeated safety training with the tool and memorized dangerous situations in the sites. The percentage of correct answers increased and the time required to judge dangerous situations decreased, suggesting that workers come to understand the dangers and focus on them more quickly, and the tool was effective for facilitating comprehension of curriculum contents (Takahashi, et al., 2013). In the second experiment, 20 workers took a risk prediction test that was composed of 4 scenes and included 20 risk factors, and evaluated their usual risk perception at work before and after risk prediction training with the tool. Performance of the risk prediction test increased and self-evaluation of risk perception became safer after the risk prediction training (to be more specific, workers evaluated if they had not understood unsafe behaviors and had acted unsafely in their sites.), suggesting that the tool was effective for improving risk perception and safety consciousness (Takahashi, et al., 2016).

4. Risk prediction training system and applicability of the system for the sites

Next, to apply this tool to actual work sites, it is desirable that managers can make use of records for when, how many times, who takes safety training with the tool, and how much the worker understands risk factors as information for safety management of the sites. Therefore, we made “a website for safety management” that managers can use to confirm and manage their records on the internet. The structure of the website is as follows: at first, a manager logs into the website with their ID and registers a tablet device with the website (Figure 2a). A manager sets up scenarios that he or she wants to deliver to a tablet device on the website, and their scenarios are automatically downloaded to the specified device. Next, when a worker takes a risk prediction training on the tablet device, the result is automatically sent to the website. A manager can confirm when, who takes which scenario, and how much he or she understands the risk factors on the website (Figure 2b).

5. Conclusion

We developed a risk prediction training tool and studied the effectiveness. In addition, we extended the function of the risk prediction training system to make use of it for safety management at work sites. The tool can be applied to other fields because of the simple structure of the tool that four images are presented simultaneously. We want to suggest the applicability of the risk prediction training system for various work sites in order to prevent accidents.

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