ERGONOMIC RISK FACTOR’S SAFETY SIGN: A REVIEW

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Abstract

One of the risks in the workplace today is the risk of ergonomic hazards, apart from the risks of hazards that often occur such as risks of physical hazards and risks of hazards from the work environment. If the risk of physical hazards and the risk of environmental hazards already have many safety signs that are widely accepted, this is not the case with the risk of ergonomic hazards that do not yet have a validated and widely used safety sign. More fundamentally, awareness of the risks of ergonomic hazards is not fully understood by both workers and employer institutions.

The method used in reviewing this paper is to enter the keywords safety sign, safety sign design, and ergonomic risk factors on Google Scholar and Science Direct.

Keywords: safety sign; design safety sign; ergonomic risk factor’s

1. Introduction

Occupational disease is any disease caused by work or work environment (Nienhaus et al., 2005). Talking about work risks, there are many studies that examine the risk factors of physical work, among others according to Alves (2007), that exposure to physical risk is in the form of potential hazards which include heat stress, gases and harmful particles in the air (CO, NO2, H2S, PCB, free silica, Pb, ZnCl and others), vib ration in machines, exposure to bacteria and parasites, potential accidents, namely falling, falling materials, electric shock, being scratched or stabbed by sharp objects and other physical work accidents, while the ergonomic risks caused by wrong posture at work. There are discrepancies that occur in the office or on the production floor that can caused ergonomic risks to workers (Keyserling et al., 1991). These risk factors are awkward position, manual handling, frequent (frequency bending) and twisting, as well as forward movement are ergonomic risk factors that can affect the prevalence of low back pain (LBP) (Nelson and Baptiste, 1995). The sources of ergonomic risk factors are workplace, equipment, devices, work methods, personal characteristics of workers, metabolic applications, physical stress and emotional stress (Drinkaus et al., 2003). Safety signs or what are often referred to as safety signs are visuals and numbers with specific meanings that are used to reduce accidents and injuries in industrial businesses and public areas (Chan and Ng, 2010b). Example safety sign in Figure 1.

2. Methods

The approach used in this study is a literature review approach or literature study. Literature search by

Figure 1. Safety Sign with Physical Work Risk Factors
(Source: Personal Documentation)

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entering the keywords safety sign, safety sign design, and ergonomic risk factors on google scholar and science direct in the 2009-2021 issue. The purpose of this literature review is to find out the theoretical framework for making safety signs, especially ergonomic risk factors that are valid and can be read by workers in the office or on the production floor. The concept of making a safety sign is carried out using literature studies, the concept of table combinations, surveys for the existence of ergonomic safety signs that exist at this time. Example safety sign design in Figure 2.

3. Results and Discussion

Results

Table 1 is a depiction of the safety sign with physical work risk factors that already exist in offices and on the production floor based on ISO and ANSI standards, while Table 2 is a depiction of the safety sign design with physical work risk factors based on the understanding of workers in the office and on the production floor and Table 3 is a depiction of ergonomic risk factors so that safety signs, especially ergonomic risk safety signs can be realized.

Table 1. Literature Review of Safety Signs with Risk Factors for Physical Work Based on ISO Standards and ANSI

| Writer   | Title                                                                 | Purpose                                                                 | Method                                                                 | Result                                                                                       |
|----------|----------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Lestari, 2014 | Conformity Analysis of the Presence of a Safety Sign Based on Hazard Identification in the Field of Profiling Prismatic Machines, Machining Department, Production Directorate of PT. Indonesian Aerospace in 2014. | The importance of identifying and controlling hazards has a major impact on the number of work accidents and the health of workers. Therefore, companies need the right application to reduce workers from hazards that can cause accidents in the workplace. | This research is qualitative research, which is intended to see the suitability of the application of administrative control, in the form of a safety sign according to standards at PT. Indonesian Aerospace. The data collection was carried out through in-depth interviews (with key informants, supporters, and keys), observation and document review. | The results of hazard identification and risk assessment have results that vary from low risk to high risk. Most of the presence and need for safety signs are not appropriate based on the results of existing hazard identification (Lestari, 2014). |
| Basri, 2014 | The Relationship between the Implementation of the Occupational Health and Safety Program with the Work Productivity of the Packer Section Employees at PT. Bosowa Maros Cement. | This research aims to determine the relationship between the implementation of occupational health and safety programs according to standards with the work productivity of employees in the packer section at PT. | This type of research is a type of quantitative research, namely analytic survey. With a population of 48 employees of the cement filling packer section at PT Semen Bosowa Maros with a total sampling method of sampling. The data obtained from observations. The analytical technique used is chiy-square | From the results of this research, it can be concluded that there are lighting measurements of the packer section at PT Semen Bosowa Maros that do not meet the requirements (Basri, 2014). |
Table 2. Literature Review of Safety Signs with Risk Factors for Physical Work Based on Workers’ Understanding

| Writer                  | Title                                                                 | Purpose                                                                 | Method                                                                 | Result                                                                 |
|-------------------------|-----------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------|
| Saputra, 2017           | Analysis of the Conformity of the Application of Safety Signs at PT. Terminal Petikemas Surabaya. | Semen Bosowa Maros. This research was conducted to determine the suitability of the application of safety signs in the work environment based on the ANSI Z535 standard. | The method used is observational with a cross sectional design, data collection through direct observation using the ANSI Z535 safety sign checklist at a certain time. There are 5 types of safety signs based on the ANSI Z535 standard studied, including the danger sign, warning sign, caution sign, notice sign and safety condition sign. | The method used is observational with a cross sectional design, data collection through direct observation using the ANSI Z535 safety sign checklist at a certain time. There are 5 types of safety signs based on the ANSI Z535 standard studied, including the danger sign, warning sign, caution sign, notice sign and safety condition sign (Saputra, 2017). |
| Chan and Annie, 2010a   | The effect of Sign Characteristics and Training Methods on the Effectiveness of Safety Sign Training. | To investigate the effect between giving the previous training method and without doing the training and the relationship between the symbol characteristics of the sign and doing the training. | Survey development and statistical analysis. | Participants from all training groups showed a significant improvement that is a large increase in comprehension performance compared to the control group and showed that using the pre-work training method increased understanding of the meaning of safety signs (Chan and Ng, 2010a). From several factors tested, the comprehension scores varied with the cognitive features of familiarity, concreteness, simplicity and meaningful signs (Chan and Alan, 2011). |
| Chan and Alan, 2011     | Understanding Industrial Safety Signs: Implications for Occupational Safety Management. | Analyzing the understanding of industrial signs in Hong Kong with several factors and different users to examine the relationship between cognitive sign features and sign comprehensibility. | Questionnaire and layer methods to capture demographics, color vision deficiencies, sign user factors, guessing scores and ratings of sign features from participants. | The results obtained in this study is to get an average understanding score that is tested 65% with a standard deviation of 28%. Easy-to-understand safety signs are “Using hearing protection” and “biological hazards” (Zamanian et al., 2013). Several user factors are predictors of significance performance, guessability scores vary significantly with cognitive features of familiarity, concreteness, simplicity, meaningfulness, |
| Zamani et al., 2013     | Understanding of Safety Signs: A Case Study at Shiras Industrial Park. | Analyze the correct understanding of safety signs. | The method used is descriptive analysis. | |
| Chan and Ng, 2012       | Guessing the Meaning of Safety Signs in Mines: Influence of User Factors and Cognitive Sign Features. | This research is to examine the effects of user factors and cognitive alert features on safety signs in mines. | Questionnaire and layer methods to capture demographics, color vision deficiencies, sign user factors guessing scores and ratings of sign features from participants. | |
Ng and Chan, 2015  
The Influence of User Factors and Reference Characteristics of Participatory Construction Safety Signs.  
This research examines the user characteristics and participatory factors referencing the signs so that they are easily understood by construction workers. A group of workers in Hong Kong construction were asked to draw references to safety signs that often occur in construction then share their drawings and redesign ideas and then analyze based on user factors such as age group, education level, work experience in the construction industry, visual image clarity, object image reference, special image reference and reference characteristics such as familiarity, concreteness, ease of visualization and inventory context. 

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Afianto, 2016  
The Relationship between Knowledge and Attitude with Workers' Actions in Working according to Installed Safety Sign Boards.  
This Research was conducted to analyze the relationship between knowledge and attitudes with workers' actions on safety sign boards installed in the wood working I subdivision of PT. Kutai Timber Indonesia Probolinggo. The dependent variable in this study is the actions of workers. Data processing consists of editing, scoring and tabulation. The technique of presenting data in this study is in the form of text (textular) and tables. Data analysis consisted of univariable analysis and bivariable analysis using Spearman with $\alpha=0.05$. 

Hardiyono, 2019  
The Influence of Compliance and Knowledge of Safety Signs on Work Safety at the PT. Geoservices Balikpapan.  
Analyzing the level of compliance and knowledge of employees with the installation of safety signs and analyzing the influence on the level of awareness of workers on occupational safety hazards at PT Geoservices Balikpapan. The method used in this research is a method with a quantitative approach through a questionnaire and then viewed from a qualitative approach through observation and interviews which aims to get a full picture of the effect of compliance and knowledge on work safety. For every one unit increase in worker compliance with safety signs, work safety will increase by 1,000. For every increase in workers' knowledge of safety signs by one unit, work safety will increase by 1,000 (Hardiyono, 2019).

| Writer            | Title                                                                 | Purpose                                                                 | Method                                                                 | Result                                                                 |
|-------------------|----------------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------------|
| Sheikhzadeh et al., 2009 | Preoperating Nurses and Technicians Perceptions of Ergonomic Risk Factors in the Surgical Environment. | Identify the magnitude of the characteristics of musculoskeletal complaints related to work in the nursing environment and the 50 PNTS participating in the research completed a self-report survey for musculoskeletal symptoms, a job description questionnaire, and a psychometric evaluation. | The 50 PNTS participating in the research completed a self-report survey for musculoskeletal symptoms, a job description questionnaire, and a psychometric evaluation. | The results showed a high prevalence of work-related musculoskeletal disorders (WMSD) among PNTS, with low back pain being the most common complaint, followed by... |
Determine the risk factors associated with ergonomics risks in the surgery room.

Harton and Soewardi, 2018
Analysis of Risk Factors Causes Musculoskeletal Disorders and Work Stress.
To identify risk factors that cause musculoskeletal disorders and work stress and provide the necessary recommendations.

Jusman, 2018
Ergonomic Risk Factors with Subjective Complaints of Musculoskeletal Disorders (Msds) at Cutting Bar Operators at Production Unit PT Iron Wire Works Indonesia in 2018.
Analyzing ergonomic risk factors with subjective complaints of musculoskeletal disorders (MSDs) on cutting bar operators in the production unit of PT Iron Wire Works Indonesia in 2018.

Discussion
Ergonomics risk factor is a problem that is often done by workers in the office or in the production floor, this problem is often considered trivial by workers because the symptoms that arise cannot be directly felt but become work-related diseases, unlike other factors. Physical risks that we can feel directly, with the safety sign of ergonomic risk factors that can be understood by workers, ergonomics risks can be reduced. Therefore, this paper discusses the design in terms of physical risk safety signs based on ISO and ANSI standards in Table 1, the design in terms of safety signs with physical work risk factors based on the understanding of workers in Table 2 and conceptual understanding of ergonomic risk factors in Table 3.

4. Conclusion
The results of the review from various existing journals, can be concluded that the design of safety sign designs, especially ergonomic risk factors, must consider the standards that have been set in ISO and ANSI and safety sign ergonomic risk factors are certainly easy for workers to understand.

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