

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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Figure 2. Safety Sign Design
(Source: personal design)

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 chy-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).

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.	analysis and fisher exact test. 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).

Table 2. Literature Review of Safety Signs with Risk Factors for Physical Work Based on Workers' Understanding

Writer	Title	Purpose	Method	Result
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.	Showing safety signs as many as 26 industrial safety signs in mainland China and 60 respondents were randomly assigned and divided into four groups, divided into a control group, conducted association learning, recall training and recognition training.	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).
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.	Survey development and statistical analysis.	From several factors tested, the comprehension scores varied with the cognitive features of familiarity, concreteness, simplicity and meaningful signs (Chan and Alan, 2011).
Zamani <i>et al.</i> , 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.	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 <i>et al.</i> , 2013).
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.	Several user factors are predictors of significance performance, guessability scores vary significantly with cognitive features of familiarity, concreteness, simplicity, meaningfulness,

Writer	Title	Purpose	Method	Result
Ng and Chan, 2015	The Influence of User Factors and 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.	and simantic approach (Chan and Ng, 2012). Construction workers with lower education levels are less understood than those with higher education levels. People with higher reference to special images (i.e., references to using images to represent image relationships that represent special relationships between objects schematically for perform complex special transformations) (Ng and Chan, 2015).
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 1 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 $\alpha=0,05$.	The results of the study using the Spearman test showed that the relationship between the level of knowledge and the attitude of workers obtained a p-value of 0.501 ($p > \alpha$), the relationship between the level of knowledge and the actions of workers obtained a p-value of 0.002 ($p < \alpha$), while the relationship between attitudes and actions of workers obtained p-value of 0.006 ($p < \alpha$) (Afianto, 2016).
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).

Table 3. Literature Review of Ergonomic Risk Factors

Writer	Title	Purpose	Method	Result
Sheikhzadeh <i>et al.</i> , 2009	Preoperating Nurses and Technicians Perceptions of Ergonomic Risk Factors in the Surgical Environment.	Dentify 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 results showed a high prevalence of work-related musculoskeletal disorders (WMSD) among PNTS, with low back pain being the most common complaint, followed by

Writer	Title	Purpose	Method	Result
		determine the risk factors associated with ergonomics risks in the surgery room.	questionnaire, and participated in a focus group to discuss potential risk factors for ergonomic OR.	ankle/ shoulder pain. In addition, lower back pain, followed by ankle/knee pain was found to be the main cause of absenteeism from work (Sheikhzadeh <i>et al.</i> , 2009).
Hartono 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.	Using data collection instruments, including Nordic body map (NBM) questionnaire, job stress questionnaire, subjective fatigue questionnaire, ergonomic evaluation checklist and SPSS application for data processing.	The cause of the risk of musculoskeletal disorders is the presence of repetitive activities, unnatural work attitudes, while the causes of the risk of work stress are physical factors of the work environment and somatic factors (Hartono and Soewardi 2018).
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.	This research is descriptive analytic with an observational study to provide an analysis of the research conducted by observing the conditions that occur through direct observation and observation using a cross sectional research design to see risk factors in a certain place and at a certain time.	There is no significant relationship between age and MSDs complaints with a <i>p</i> value of 0.665, there is no significant relationship between years of service and MSDs complaints with a <i>p</i> value of 0.51, there is no significant relationship between physical activity and MSDs complaints with a <i>p</i> value of 1,000, There is no significant relationship between repetitive movements and complaints of MSDs with a <i>p</i> value of 0.483 (Jusman, 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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