Enhancing Construction Safety Culture: A Systematic Review of Factors, Practices for Ergonomic Improvement and Practical Applicability in Construction Industry

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Abstract: Some of the major factors contributing to accidents in the construction industry are human behavior, intricate and distant work sites, labor-related complexities, hazardous safety cultures, the utilization of perilous machinery, and non-compliance. Notably, renowned databases, including Springer, Taylor & Francis, ScienceDirect, Research Gate, and Google Scholar, were all included in this systematic review (SR) that was completed following the PRISMA method. The goal is to investigate the relationship between safety culture and the effectiveness of safety measures on construction sites and for construction employees. In this systematic review, various keywords were selected, including "safety culture," safety performance, worker behavior," construction sites," "improved safety culture," and "ergonomic practices". Research published between 2016 and 2022 was considered, as were studies of safety culture in the construction industry that were linked to improved safety culture among construction employees. In this paper, the author examines the role of safety culture in the construction industry on the basis of 17 recent studies based on when the study was published, what technologies were used, and their relation to the construction industry. Researchers prefer proactive measures, which affect the safety culture and climate for construction employees. The study shows that more research is needed, especially in the areas of safety practices and the relationship between agronomic practices and the building industry, to figure out the complicated relationships between variables..

Keywords: Construction Accidents, Construction employees, Ergonomic practices, Safety culture, Improved safety culture, Worker behavior.

Introduction

When employees of a business or organisation regularly put safety first and follow safety rules, that business or institution has a safety culture. That's how things go around here. A long time ago, between 41,000 and 12,000 B.C., people lived in caverns along with other man-made homes on flat land. This is when the construction business began to grow(Zhen Tang, 2025). When it involves the building.

business, the first written records of safety management are from 2200 B.C. When Hammurabi, who was the king of Babylon, made his rules, he said it was illegal for walls to fall down and kill the people who were inside. The building business (GDP) is one of the biggest producers to global GDP along with one of the biggest employers in the world(Siregar et al., 2024). Construction operations are very important to the world economy; they add 6% to it. But it is also partly to blame for a lot of work-related illnesses and accidents, which make up about a third of all recorded cases across all sectors

The building industry makes a big difference in the financial standing of the country. It accounts for over 5 percent of the GDP as well as more instead of 78% of total capital growth. So, the building industry also affects how the rest for the world sees the country's ability to come up with new ideas(Hatem et al., 2022). A lot of people think that working in building is one of the most dangerous jobs out there. This is clear from the numbers on the number of deaths on the job, the number of accidents, and worker's compensation(Pheng & Hou, 2019). Due to the particular characteristics of building work, workers are subject to many risks, some of which can be deadly(Wang et al., 2022). Construction projects always come with a certain amount of risk and uncertainty because of the unknowns and risks that come with them.

As to the importance of construction to the world economy, an astound 6% of it is being contributed(Berglund et al., 2023). According to the most recent statistical data available up to 2020; as illustrated in the First Figure, the construction industry is showing a severely high number of injuries and illnesses sustained in the workplace relative to the average of the other industries in the economy(Fauzan Akhtar et al., 2025).

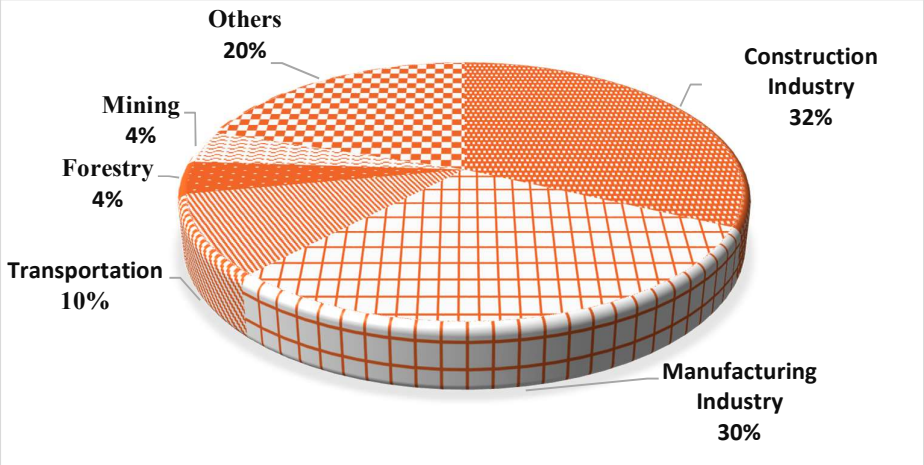


Figure 1: Rates of workplace accidents in various industries (Deepak, M. D. 2020)

Figure 2 also provides a detailed account of accident ratings related to construction. The construction industry comes with many dangers, but it is estimated that approximately 70% of all construction-related injuries or fatalities occur on site, 20% of injuries/fatalities occur because of external factors (such as unexpected events while operating a vehicle), and 10% occur in locations that fall outside the boundaries of traditional construction sites (such as parking facilities or homes)(Newaz et al., 2025).

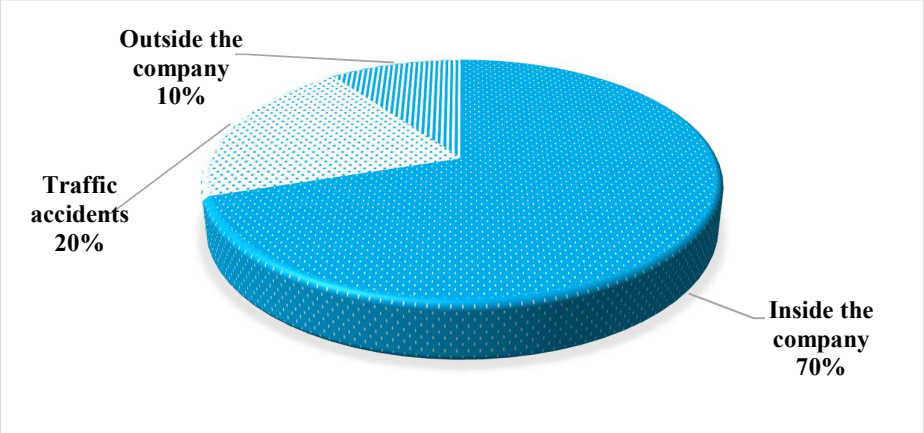


Figure 2: Percentage of workplace accidents by region (Deepak, M. D. 2020)

Fostering a safety culture in organizations can strengthen the organization's efforts toward improving workplace safety and preventing incidents while simultaneously helping to enhance the reputation of the industry. Ergonomic factors that are affected by these changes may vary from having an adverse effect, neutral effect or a beneficial effect(Naji et al., 2021). By having an emphasis on ergonomic factors within the organizational framework for these types of initiatives, this approach could result in a substantial improvement in the health of the workforce(Sundström & Nygren, 2023).

It is prudent to identify and eliminate hazards to the worker as a primary focus in construction activities; however, even with increased awareness of ergonomic issues and a greater knowledge of traditional ergonomic issues, there is still a high incidence of musculoskeletal problems in the work environment, and therefore there is currently an increased focus on developing safety systems that aim to improve the utilization of available resources while decreasing the potential risk of accidents(Tandazo et al., 2025).

1.1 Development of Safety Management

The Industrial Revolution, which began at the end of the 18th century, had a great impact on the manufacturing sector, culminating in an increased use of mechanical labor. At the same time, factories, which are large manufacturing buildings where workers were directly supervised while they worked, were built to accommodate larger quantities of products and materials being manufactured by employees and where workers were assigned specific duties during the production process. However, as the industrial revolution spread quickly, it also led to more accidents and deaths at work because of the use of dangerous manufacturing methods. The safety management system is shown in Figure 3 (https://safetyculture.com/topics/safety-management-system).

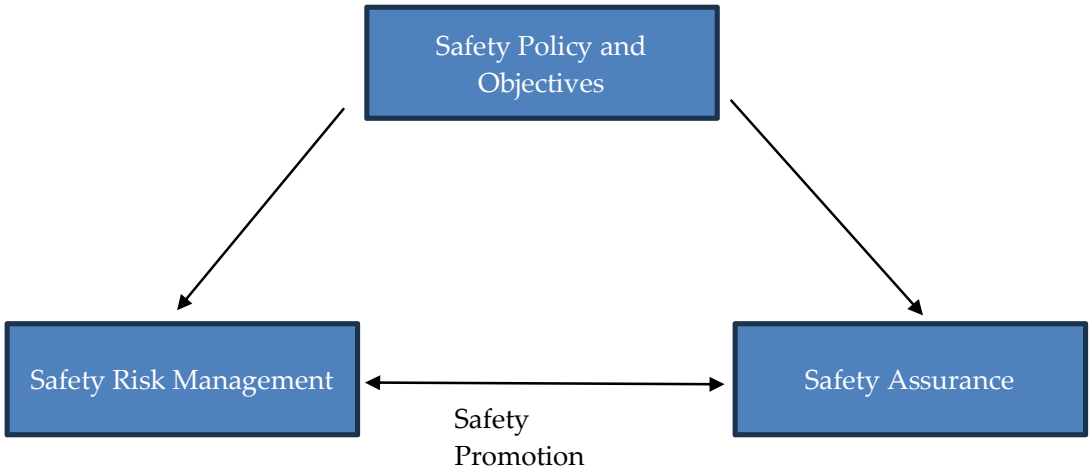


Figure 3: Safety Management System(Roselin Manawis, 2025)

During the 20th century, technology advanced quickly, and the risks that came with it got worse. People often say that the modern safety movement began with the National Safety Council, a charitable organisation that was created in response. Later, with help from companies all around the world, similar non-governmental groups formed, such as an Intergovernmental Labor Organization (ILO) or a British Safety Council (BSC). In the next stage, payments for workers' compensation were a big deal. Over time, states took on greater duty to make sure the safety for numerous businesses.

The Indian Construction Sector's Framework for Assessing Safety Performance

In 1998, an extensive survey was carried out in 175 countries to determine the total number of accidents around the world. Results from the survey showed that each year there are around 264 million non-fatal work-related accidents globally and about 350,000 fatalities in both the construction and industrial sectors (Berhan, 2020). There is a large discrepancy in accident rates between developed and undeveloped nations, but in developing nations, the construction sector is having difficulty keeping pace with the rapid development of the industrial sector and effectively identifying and eliminating potential hazards and risks within their projects.

In India in 2019, 48,000 people died on the job in the building industry, which was responsible for about 28.2% of all worker deaths that year. The building business added a lot to the country's Income in the last three months of 2018, hitting an aggregate of INR 3,535.88 billion. Even though India has taken a lot of steps to improve and strictly enforce safety rules, like passing wage laws and establishing security regulations, the number of accidents is still rising at an alarming pace. In India, most construction work is done by hand, and it takes a lot of people to get the job done. Because the job is unstable, it's a very hard place to work. Most of the people who work on building projects are only there for a short time and have to move around a lot.

The nature of construction accidents

Accidents happen when a lot of different things come together. Each of these things has the ability to cause the event. Two main groups of variables are affected by a lot of different factors. Proximal factors include workers' opinions, abilities, awareness, health, or levels of fatigue(Hosseinian & Torghabeh, 2012). These can be affected by the success of industrial psychology in communication, motivation, or training, as well as the employee current health and the site hazards that happen because of poor planning, management, as well as supervision, which leads to a lack of an H&S culture. In the second group, "distal factors" are those that are linked or connected to, like design issues like choosing

the right materials and tools and the design setting where they will be used(Dyreborg et al., 2022). Active fails happen when bad decisions are made during the planning and design stages.

According to, one type of sign is a list of statistics on accidents, injuries, deaths, and the seriousness of these events. In comparison to other fields of work, building has the most crashes that result in major injuries or death(Gürcanli & Müngen, 2013). Due for the high number for accidents that happen there every year, the building business is responsible for about 20% of employment-related deaths in the US. says that accidents are unplanned events that hurt people or damage things that have value on their own. An accident like this can cost a lot of money, make things less efficient, and have long-lasting effects like low confidence among employees and shame in public(Nazeer Ahamed & Mariappan, 2023).

1.3 Hazards and risks leading to accidents in construction industry

The word "risk" can mean both how likely it is that a certain danger will cause harm and how bad that harm will be. Anything that could put someone in danger is called a threat. When you think about the health and safety risks and threats in building, you should remember the five main groups that were talked about earlier as possible reasons for accidents(Li et al., 2020). As you can see, breathing in, absorbing, and eating are all clear health risks and hazards in construction. Falling from heights, car accidents, and being hit by are also clear security risks and hazards. Finally, musculoskeletal disorders related to work (WMSDs) and "body stressing" are clear ergonomics risks and hazards.

Dangerous chemical substances (HCSs) can get into the body through breathing, eating, or skin absorption. When breathed in, dust, fumes, vapours, mists, or gases are just a few of the things that can make your eyes and lungs itch and do more serious damage to your organs over time. When materials are moved and processed in the building business, dust is made. Pneumoconiosis, asbestosis, and asbestosis are all lung diseases that are caused by breathing in mineral and metallic dust for a long time(Maidana et al., 2023). These diseases are all caused by breathing in very small particles of dust, which can get into the lungs even if you cough or sneeze. Metal-fume fever can be caused by breathing in the complex fumes that are made by welding processes. Breathing in solvents can damage the lungs and the central nervous system (Deacon, 2004; Smallwood & Deacon, 2001; the Occupational Health and Safety Council. 2004; the Building Industry Development Board. The process through which HCSs get into the body through pores is called absorption. Some jobs can make people more likely to get skin diseases like eczema and pimples. These include using chemicals, working with concrete (which is alkaline and rough), and handling asphalt and other similar substances (Deacon & Smallwood). 2010; Bureau of Labour Statistics (BLS) of the US Department of Labour(Singh & Malaviya, 2023). HCSs are rarely eaten by accident; most people are exposed when they touch goods that contain them and then eat them without washing their hands first.

1.4 Ergonomics in construction

Ergonomics is very important in the building business. The main goal is to make workers more comfortable, safe, and productive by redesigning and rearranging tools, equipment, areas, and jobs. Because there are so many physically hard jobs in the building business and so many accidents that happen on the job, ergonomics play a big role. There are many advantages to adopting ergonomic principles in construction, including less chance of injury, improved morale, and greater efficiency on projects. Some of these advantages are due to the use of well-designed tools and equipment, the sequencing of tasks (how you order your work), and taking regular breaks(Kim, 2017). Ergonomics has been shown to reduce fatigue and stress, which results in greater productivity and attendance, according to studies done. Additionally, emphasized the importance of good communication and teamwork between architects, engineers, project managers, and laborers to implement ergonomic

practices successfully. Therefore, there is a connection between an industry-wide approach to implementing ergonomic principles and the health of workers as well as successful project completion(Shem Kihara Maina et al., 2012).

1.5 Analysis of Accidents and Requirements for a Safety Culture

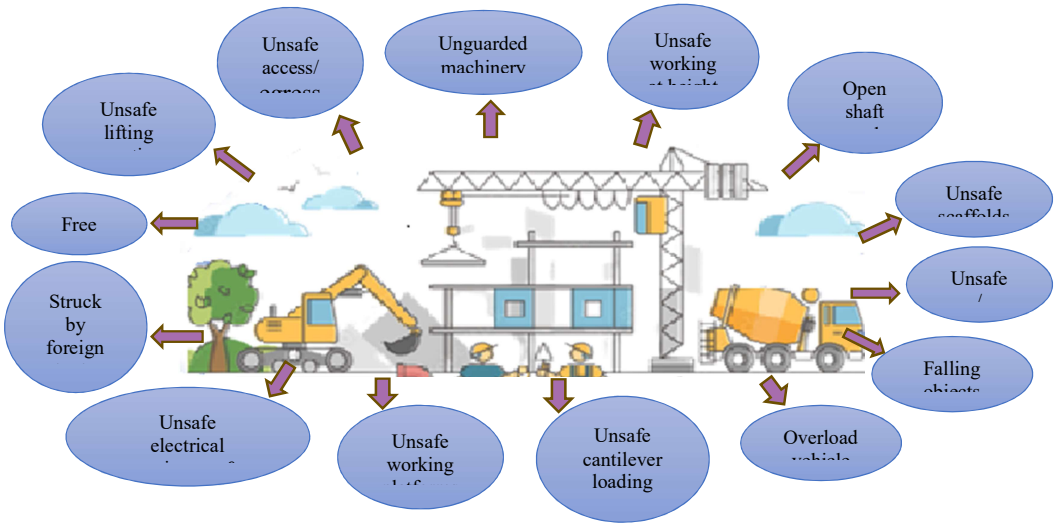
There is an urgent need to improve worker safety in order to reduce the incidence of accidents that occur on construction sites. The construction sector in developing countries continues to pose high risks to employees' health and well-being. Around the globe, construction companies have been actively establishing an array of rules and regulations to improve safety; nevertheless, there remain gaps in the distribution of safety information throughout the construction industry, creating difficulties with raising employee awareness of safety risks, procedures, and practices(Torres et al., 2025). The way work is conducted, as well as the workforce involved and organizational structure of the construction industry, all play a role in exacerbating this issue. A casual approach to safety is a leading cause of both injuries and fatalities on construction job sites worldwide. Therefore, it is essential to create a priority on overseeing the development of the safety culture within construction organizations to ensure a safe working environment for employees, thereby ultimately reducing the number of accidents in the construction sector(Heredia Morante et al., 2024). In addition to the negative effects that accidents have on employee quality of life and potential loss of life, construction site accidents can lead to other negative consequences, such as delays in projects, increased costs of materials and services, and heightened pressure on subcontractors and their employees(Liu et al., 2025).

1.6 Leadership in Safety's Importance to Risk Management

Workplace safety and safety culture cannot be the sole responsibility of the employee(s). Culture is determined by behaviour, which demonstrates the ideals that are prevalent. There have been numerous scholarly studies on the relationship between leadership and organisational performance regarding risk management(Niu & Liu, 2022). Several studies also show that without sufficient support from leadership, improved health and safety on an ongoing basis is not likely to succeed. In addition, scholars focused on workplace health and safety management see that the leadership role in creating a safe workplace is critical. Reviewing the relevant literature, researchers have arrived at the conclusion that senior leadership is ultimately responsible for determining the variables affecting safety performance in organisations. It is essential for leaders to establish appropriate performance measures for evaluating and directing safety similar to those established for the management of the remainder of their business(Adra et al., 2024). Safety study from the past has looked at and analysed the rules and procedures that are already in place in companies that have strong and good safety cultures. However, it is hard for businesses to come up with safety rules and guidelines that cover every possible scenario. Since values determine behaviour, even when rules and laws are in place, it is important to understand the values that drive the safety practices in businesses that are praised for having great safety cultures.

Injury and accident caused by mistakes made by people could be cut down with good safety leadership. Occupational Health and Safety Administration (OSHA) of the US Department of Labour knows that good leadership and management are needed to deal with safety issues in the workplace (Wiengarten et al., 2025). Figure 3 shows some of the risks that could happen when running building equipment. This is how the automated safety management system for a future building site could be written.

Figure 4: The idea for creating a safety management system (Jiang et al., 2020).



The HSE (Health and Safety Executive) has said that good safety performance can't happen without good leadership. Another thing the Federal Protection Commissioner stressed was how important it is for top management to care about safety in order to create a culture of safety(Kaila, 2022). Few studies have been done on the leadership while self-reported safety behaviour of top managers in package station operations, but a few stand out.

1.7 Safety Performance Enhancement

When a business fully adopts a proactive security culture, it includes the idea of constant growth and uses it to improve performance and safety standards. Everybody in the company does their part to keep the workplace safe. People are still trying to change their behaviour, and most people agree that it's important to deal with the root problems that cause bad attitudes and actions(Haleem et al., 2025). The organisation starts to use a normal method of continuous and slow growth. The company adopts a forward-thinking approach in making strategic decisions, considering both present and future implications. It proactively finds potential issues and takes necessary actions to prevent their occurrence(Asamani, 2020).

Every choice is carefully thought through, taking into account how it might affect the safety of the whole organisation, including all activities and areas.

When workers understand how the company works better, they can help top management run the business more efficiently.

The company promotes a spirit of ongoing growth by pushing learning both inside and outside the company. They use this expertise to get more done.

When making important decisions, both management and workers think about culture factors. They push for a mindset of safety because it boosts profits and work.

It is emphasised how important it is to value organisational learning and set up ways to keep and use this information. It is very important to see the link between safety results and the affects of operating processes.

1.8 Importance of Occupational Health and Safety (OHS)

For example, professional health and safety looks out for the mental, emotional, and physical health of people who work in offices or on building sites. Employers and people who know a lot about safety and health measures need to work together to make sure that building workers are safe and healthy(Memiş, 2016). They also need to think about things like workplace health, risk, solutions, modern cleaning, toxins, education, safety on the job site, ergonomics, brain research, and the building safety management system. Employees' personal safety is a top priority in safety and health policies because it is thought that an environment that is healthy also keeps its workers safe(Tamers et al., 2020). Making sure that every building site is healthy and secure for every person who works there is the most important thing.

There are several wins for all stakeholders when it comes to occupational health and safety programs and practices in the workplace(Zachar & Majlingová, 2025). Reasons why Occupational Health and Safety (OHS) in the workplace, whether inside or outside the office (construction sites), is important:

Improved productivity and focus: When the workplace prioritizes safety, employees are likely to become more efficient and focused on achieving results.

Reduced absenteeism: A safe and excellent work environment can lead to decreased absenteeism among employees.

Professional image: A workplace that is safe, organized, and well-maintained reflects professionalism and contributes to a positive image for the company.

Employee satisfaction and security: Ensuring a safe working environment contributes to the happiness and sense of security among staff members.

Cost savings: Workplace accidents might cost protection and insurance. OHS precautions and training can save firms money over time. This includes lowering personnel injuries, car, and construction damage claims and employee absences (YILMAZ et al., 2021).

Objectives of the Current Study

To propose a distinct concept of building a company safety culture in comparison with the definitions of organizational safety culture that are already in use.

The Safety Culture Interaction (SCI) Model presented in this study shows how a project's safety culture grows and how the owner, contractor, and subcontractors interact.

To develop a safety culture for ergonomics professionals by providing a platform for experimentation with modified frameworks.

To uncover elements that relate ergonomic consciousness to a culture of safety. These pieces could aid ergonomic consciousness and safety culture research.

To manage emerging safety hazards and sustain excellent safety performance over time, a “safety culture" has been proposed. Examine how risk and safety culture impact construction project success in complicated projects.

To characterize the shared assumptions, norms, and perspectives of an organization's members

concerning safety.

Review Methodology

The steps taken in this comprehensive review (SR) are in line with the preferred report items for Systemic Reviews as well as Meta-Analyses (PRISMA) standards. In the field about evidence-based research, PRISMA sets standards for how meta-analyses and systemic reviews should be done and reported. PRISMA was made to make it easier to report studies that look at how well medicines work, but it can be changed to record reviews of studies that look at other things, like research methods, building a theory framework, or coming up with hypotheses.

3.1 Search Strategy

A SLR (Systematic Literature Evaluation) is meant to improve the safety mindset that is already in place. The study for "Using Ergonomic Instruments in the Construction Industry" came from 12 main academic literature sources. These were Science Direct, the IEEE, Springer, Educational, ASCE, Maryland Institute of Technology, ergonomics, Velvet Insight, the Civil Engineering study Gate, Scimago Journal, and IJOI. SLRs help researchers find out about past research that has dealt with their topic or research question.

A thorough search was done using numerous keywords on the seventh of November, 2022, to find appropriate scholarly works. The search was done in several sources, including Science Direct, and there were no date limits on the publications. The summary, title, and theme all had keywords that were used during the course of the search. Articles, reviews, works papers, lists, and papers from conferences were the only types of documents that were looked at. The list of the Science Direct Keywords and Close Perfect search words used in the search is shown in Table 1. It was also looked into how to name different terms. In this search batch, a total of twelve records were found. Table 1 shows how the keyword search approach works.

Table 1: Keywords in the search strategy.

	Keywords
1.	How does safety culture impact ergonomics in construction industries?
2.	Exploring the relationship between safety climate and ergonomic practices in construction industries
3.	Analyzing the effect of safety performance on ergonomic strategies to prevent injuries on construction sites
4.	Integrating ergonomic principles for enhancing safety on construction sites.
5.	The role of safety culture in promoting ergonomic solutions for construction workers

3.1.1 Selected Brand for Research: Exploring the Chosen Brand for Study

On the first of January 2022, we looked at past studies to see the amount of times the biggest companies showed up. did a keyword search for each question without any filters. The results were

split into two groups: studies that checked for validity and dependability and studies that gathered data. To find the best product line, two different groups of people were asked to take part. A product search by keyword was made for companies that had one of the nation's five best-selling products in the years 2019 and 2020 and ten or more different devices released in the first batch. The names, summaries, and methods parts of the works were then taken off the final list. This was accomplished to get rid of articles that weren't important to the study and find out what other goods were employed in the tests. For each of these kinds of goods, the author made a list and sent out a new set of calls. Eleven extra individuals were added in the end. In the results part, the study's writers wrote a description of what they found, including the term that was used to find each item.

3.2 Scrutinizing of paper for study

There are four steps in the selection process in the Primary Studies (PS): discovery, eligibility, admission, and repeated screening. A systematic search of many databases and sources, including full-text articles from Science Direct, the International Energy Agency, Springer International Publishing, Academic as well as Ergonomics, ASCE, the MDPI, Scimago Journal of Ergonomics, Emerald Insight, the Civil Engineering Research Gate, or IJOI databases Xplore, found a total of 6,407 possible studies. This was the first step. There are now 195 studies in the pool after the duplicate copies were taken out. In the second step, the title, keywords, and summary of the piece were looked over to make a first judgement. Still, 6,540 data points are missing because they fail to satisfy the standards for inclusion. This is mostly because they don't fit the study subject or optimisation topic. These two records, which were marked "combined" and "unclear," were sent to be looked at more closely. Figure 4 shows the evaluation of the SR database, which shows how far along the PS selection procedure is. Out of the 195 studies that were looked at, 28% were about safety practices in construction, 17% were about how developed the health and safety environment is in the building services sector, or 33% were about how to create an atmosphere of safety for construction projects.

A thorough study of all the relevant books and articles listed in the library was also carried out. Following the guidelines set out in Table 2, studies were chosen to be included or left out based on the additional data and descriptions that were given.

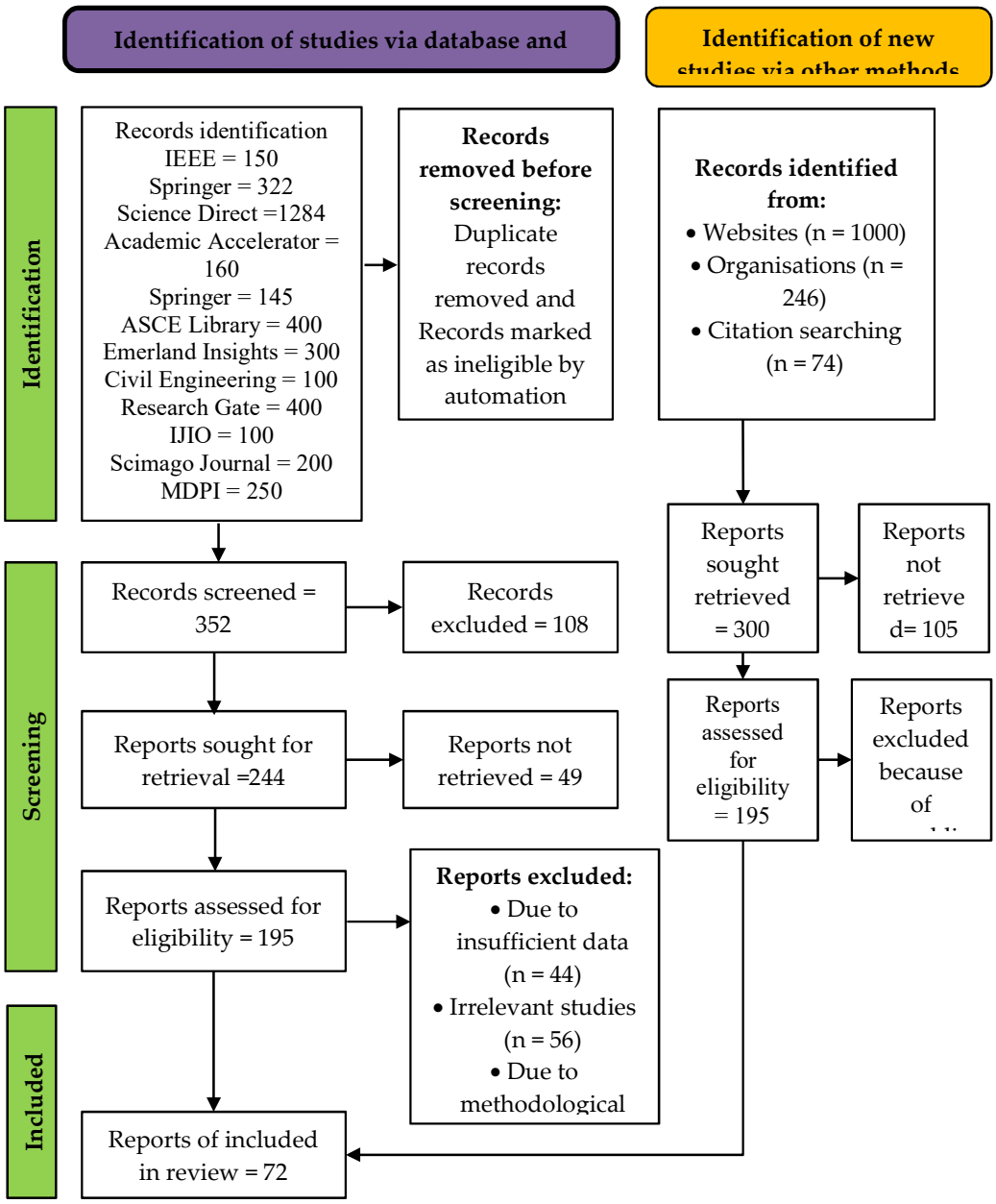


Figure 5: A PRISMA-based flowchart for systematic reviews of publications found in databases.

Table 2. Principles for SR's Exclusion and Inclusion

INCLUSION CRITERIA	EXCLUSION CRITERIA
I1: PEER REVIEW MUST HAVE BEEN PERFORMED ON THE PAPER.	E1: Research papers that don't center on the effects of physical strain on the body.
I2: THE LANGUAGE OF THE DOCUMENT IS RESTRICTED TO ENGLISH.	E2: Grey literature sources.
I3: THERE IS CURRENTLY NO ESTIMATED RELEASE DATE.	E3: Repeated study or publication.
I4: THE PAPER NEEDS TO APPEAR IN A JOURNAL THAT PUBLISHES RESEARCH OR LENGTHY ARTICLES.	E4: Research papers, working papers, and final project reports.
I5: THE PAPER SHOULD MEET THE STANDARD CRITERIA FOR BLIND REVIEW, REGARDLESS OF THE IMPACT FACTOR	E5: The paper should not deviate from the specific focus and precision indicated in the given title.

Results

4.1 Study Selection

There are a lot of different writers who have used this method (Delphi, EFA, P DO, PDCA, ANOVA, etc.) and published their results (31).

Table 3: Key findings from the studies on the Improvement of Safety Culture Using Ergonomic Tools in the Construction Industry.

Author	Title	Technique	Outcome	Total citation
Trinh and Feng [2022]	"A Maturity Model for Resilient Safety Culture Development in Construction Companies."	Delphi	These findings suggest the model has the potential to serve as a useful resource for assessing and inspiring the advancement of companies' capacities to manage safety hazards.	2
Bhagwat and Kumar [2022]	"Investigation of multi-level safety culture in the Indian construction industry: a multi-level employees'	Plan Do Check Act (PDCA)	The results showed poor safety compliances and substantial (p 0.05) perception variations among workers across levels.	2

	perception-based approach."			
Buniya et al., [2021]	"Barriers to safety program implementation in the construction industry."	Exploratory Factor Analysis (EFA)	The results demonstrate that the latent constructs to which they were allocated have loading indications that are greater than the cross-loading of all other constructs.	73
Stiles [2021]	"Developing a safety culture maturity tool for the construction sector."	Project Delivery Organisations (PDO)	Using a tool like the Maturity Matrix would allow them to establish a standardized method of evaluating the culture of their projects and identifying where they can make the most progress.	1
MD et al., [2021]	"Influence of knowledge-based safety culture in the construction industry: a stakeholder's perspective."	Factor Analysis Technique	The findings indicate that the construction industry, as a collective, demonstrates a limited understanding of the High Occupancy Construction (HOC) concept.	5
Yap and Lee [2020]	"Analysing the underlying factors affecting safety performance in building construction."	Hypothesis Testing Method	Management, foremen, professionals, and front-line employees all had safety culture measuring ratings of 78.8, 77.6, and 77.4, respectively, contributing to an aggregate level of	43

			77.4 for all businesses evaluated.	
Williams et al., [2020]	"Assessment of health and safety culture maturity in the construction industry in developing economies."	Kaiser–Meyer–Olkin (KMO)	The findings suggest that the suggested instrument might be a reliable, valid, and sensitive tool for studying how the construction industry's safety culture affects the knowledge dimension.	35
Alghalban et al., (2020)	"Epidemiology of Needlesticks and Sharps Injuries among Healthcare Workers and Organizational Safety Climate."	Standard Review	Organizational safety atmosphere was highest when sharps containers were easily available (81.1% of respondents) and where there was open communication between staff nurses and managers (78.9%).	5
MD et al., [2019]	"Developing a knowledge-based safety culture instrument for construction industry: Reliability and validity assessment in Indian context."	ANOVA	The study's findings provide useful information for construction industry leaders to evaluate and improve current safety practices.	31

Tehrani et al., [2019]	"Investigating factors of safety culture assessment in construction industry projects."	Simple Random Sampling (SRS)	Results suggest Ghana's construction sector culture of safety and health is pathological., Even while Ghanaian contractors have safety rules and standards of conduct, safety isn't a critical business risk.	17
Al-Bayati et al., [2019]	"Construction safety culture and climate: Satisfying necessity for an industry framework."	Bootstrapping Technique	Management commitment, evaluation of work dangers, supportive atmosphere, and communication had the largest influence on contractors' safety culture in the analyzed projects, whereas job stress had the least.	49
Hola and Nowobilski [2019]	"Analysis of the influence of socio-economic factors on occupational safety in the construction industry."	EFA	According to the results, construction safety culture is represented by the MS factor, while the construction safety environment is characterized by the SS factor.	29
Feng and Trinh [2019]	"Developing resilient safety culture for construction projects."	Machine Learning (ML)	The data demonstrate that each of these variables has a unique impact on the total number of workplace injuries.	41

Aburumman et al., (2019)	"Evaluating the effectiveness of workplace interventions in improving safety culture: A systematic review"	Standard Review	The majority of studies improved safety culture overall. Safety-focused, leadership-oriented, and behavior-monitoring interventions proved to be the most effective overall.	87
Chen et al., [2018]	"The impact of safety culture on safety performance-a case study of taiwan's construction industry."	SEM	The findings suggest that construction businesses might create a resilient and adaptive safety culture by methodically responding to typical dangers, rare threats, and unforeseen events.	18
Guo et al., [2018]	"A system dynamics view of a behavior-based safety program in the construction industry."	SEM	There is no statistically significant correlation between safety commitment and attendance.	126
Abdullah et al., [2016]	"Safety Culture Behaviour in Electronics Manufacturing Sector (EMS) in Malaysia: The Case of Flextronics."	Standard Review	The proposed research framework has an R2 of 0.227. In other words, the proposed framework accounts for 22.7% of the observed variance in the dependent variable.	37

Discussion

5.1 Enhancing Health and Safety in the Industry Through Ergonomics

Through the progression of the construction industry, the rise of harmful ergonomic risks for workers is increasingly reflected. As evidenced through the occurrence of Work-Related Musculoskeletal Disorders (WMSDs), the construction industry has been continuously identified as an industry with incredible risk to the health and safety of the worker. In order to reduce the number of

ergonomic risks to the worker, appropriate steps should be taken during hiring so that the job demands are an appropriate fit for the physical abilities of the worker. Additionally, breaks for meals and rest should be scheduled for regular periods throughout the workday, and transitioning to mechanization or semi-mechanization should be a focus of the company.

The main purpose of this study was to come up with a complete ergonomic intervention plan that included three methods: (1) classes or training, (2) participatory ecology (PE), and (3) redesigning workstations. Through this study, the effect of this model in the number of people in bad posture at an Iranian metals factory has been found. The main goal was to get rid of the work positions that were linked to work-related musculoskeletal diseases (WMSDs) by lowering the risk factors that the workers who took part in the study noticed.

In broad terms, this research aimed to accomplish the following objectives:

The goal was to come up with a complete and customised ergonomic intervention strategy that would work well in this particular workplace.

The goal of this study was to improve working conditions by using methods that involve workers.

The goal of this study was to find out if a chain training intervention strategy could lower the number of musculoskeletal diseases (WMSDs) that happen at work.

The goal of this project is to use real ergonomics knowledge to make redesigning and improving workstations standard practice in the industry.

Musculoskeletal diseases (MSDs) are still the most common type of illness related to work. This makes us wonder why past efforts to control the problem have not been more successful. The most common type of disease caused by work is musculoskeletal problems. About a quarter of workers in EU countries say their back hurts at work, and another 23% say their muscles hurt. MSDs are the main reason why people miss work in the United States. Most workplace accidents that don't end in death in the US are musculoskeletal injuries, like sprains and strains. There were about the same number of complaints from workers in Brazil asother countries. Shoulders (49%), spines (47%), and backs (39%), in that order, were the most common places affected. In 2005, nearly 69% of the overall work-related injuries discovered in Sweden were WMSDs. More than one in five building workers were affected (reference missing). The worst effects are felt in developing countries. Nigeria, Thailand, as well as Tanzania had higher rates of accidents and injuries than Europe. There will come a time when every building worker can't do their job because of minor accidents or health issues. But it looks like almost all accidents and illnesses in construction can be avoided. This is because health and safety problems are closely connected to how building projects are planned and how hard work is done by hand. Most risks in the building business could be caused by bad site knowledge, collaboration, and measurement tools. Construction companies can avoid these risks and accidents by learning about and understand High-Level Structure (HLS). People who work in building need to be aware of the dangers they are up against. So, the building business could do a lot better when it comes to safety and health if they had better information about sites, physical jobs, and ongoing education and training.

5.2 Methods for Minimizing Ergonomic Risks in the Industry

The study's main goal is to look at four important environmental risks and suggest some changes that could be made to work routines to lower these risks. Because of this, many things could be changed to make ergonomics easier to use and to lower the risks that come with it on the job site. To reduce workplace hazards through the application of ergonomic principles, various methods may be employed, including communication, management controls, ergonomic design, training/education,

and establishing formal ergonomics programmes (Singh et al. , 2023). The benefits of this framework include being able to assess each individual's workstation ergonomically; providing a list of the potential risks associated with that individual workstation, and providing solutions to reduce these risks by adapting the worker's activities to create less stressful situations. The ultimate goal is to reduce the frequency of employee claims and injuries while also ensuring that the costs associated with workers' compensation are lower for the entire industry.

By choosing the correct ergonomic design for a job or process, you will be addressing the true cause of workplace stress more effectively than any other solution. Therefore, from the very beginning of creating a workplace environment, ergonomic design should be a top priority and a key consideration.

CONCLUSION

In closing, this article has provided an overview of significant aspects of safety culture related to the construction sector and how it relates to the safety of employees and the implementation of safety protocols. When you examine the factors that can lead to injurious incidents at a construction site, including individual actions, challenging conditions of the job, excessive workloads, and the failure to comply with established protocols, you can see how crucial understanding and addressing safety culture is at a construction site. To conduct this type of review systematically and with the highest level of accuracy, a robust methodology was required to identify reputable sources to develop an exhaustive list of studies relevant to the topic and based on optimal keyword searches followed by clearly defined inclusion/exclusion criteria that enabled the researchers to compile a current, representative number of studies available for use within the systematic review process.

The findings from the combination of the 17 most current studies contribute to our understanding of how the safety culture of a construction site influences the effectiveness of safety protocols on that site. By evaluating various components of the safety culture, these studies provide much more detail than mere numerical quantities concerning the relationship between the safety culture of a construction site and how the implementation of safety procedures occurs; thus, allowing us to understand how safety measures perform at construction sites to be able to make these safety measures more effective using the perspective of ergonomic considerations. Ergonomic experts can benefit from the new model developed as a result of this research and apply it towards improving the safety culture of their respective organizations. The fact that 72 different studies were considered using the PRISMA technique shows how thorough this study is, but it also shows how much more there is to learn from the following studies which are from following databases: ***Science Direct = 14, Taylor & Francis = 4, Inder Science = 2, ASCE = 3, IEEE = 1, Emerald Insight = 3, Civil Engineering = 1, Research gate = 5, IJOI = 2, MDPI = 3, Books google =1, Government office for science = 1, Sabinet = 3, IJCESEN = 1, IJPM = 1, Shodhganga = 2, CIDB = 1, Makshi = 1, CORE = 1, virtual Library = 1, IOP = 2, Ergonomic = 3, HSE = 1, JEP = 1, Sciendo =1, NTH = 1, Springer = 1, Safety Research =2, IJOSE = 1, Safety Science = 3, IJOHFE = 2, Environmental Psychology = 1, Google search= 2***

The total number of research taken = 72. (Reference has a total of 72 numbers)

Finally, this study contributes knowledge about the impact of safety culture on worker safety in construction. Through the ongoing evolution of new technologies and methods in the construction sector, this research can guide both researchers and practitioners to create safer and more efficient work environments. However, the journey toward a complete understanding of safety culture will still take

time, and continued research is needed by scholars on the various dimensions of this important subject so that construction workers may work safely and be healthy.

The research in this paper provides an updated framework for ergonomics practitioners to utilize safety culture, and by utilizing an explorative study methodology, the authors will be able to customize the developed frameworks to the environments being studied. To determine whether or whether this evaluation tool can be used by ergonomists and individuals in a variety of business settings, more study is required.

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