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Ergonomics and workplace design

Enhancing workers productivity and well-being in a retail/grocery store

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ABSTRACT:

Ergonomics in the workplace is an important issue in our world today. Many organizations around the world are physically demanding environments and an example is retail or grocery stores. This study explores ergonomics and its principles. The role ergonomics plays in a retail store and how it makes retail employees more productive at what they do. Using a qualitative approach, data was collected by survey and interview from a retail store with 19 employees in Pori, Finland. The research findings prove that ergonomics no matter the type either cognitive, physical or organizational has a significant advantage in making retail workers more productive. The knowledge of ergonomics and its principles is ideal in a grocery or retail store because it reduces musculoskeletal strain, improves productivity, and reduces fatigue, and stress from repetitive tasks. From the analysis and result, ergonomic training is essential and its introduction to retail employees should be a first point of knowledge. After the introduction, the use of ergonomic tools is explained to the workers as a big factor in helping them to be productive and this factor increased workers' satisfaction. The findings show that ergonomics is needed in retail stores where its principle guides the workers, optimizes their ability, and reduces their visits to occupational facilities. Further research can be done in the future to examine the long-term effect this study will have on another retail stores across different cities and countries around the world.

KEYWORDS: Ergonomics, workplace design, Productivity, MSDs, HSE, Retail

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Abbreviations

FMCG = Fast Moving Consumers Goods

GSTD = Go, See, Think, and Do

HE = Human Ergonomics

HSE = Health, safety, and environment

MSDs = Musculoskeletal disorder

RSI = repetitive stress injuries

RULA = Rapid upper limb assessment

VRBM =Virtual reality-based multi player

WRMSD = Work-Related Musculoskeletal disorder

1 Introduction

1.1 Background study

Ergonomics and workplace design are case studies that involve two subjects that have been relatively connected since the inception of the organization.

Ergonomics in our world today plays a crucial role in many organizations. Many or all organizations with physical structure are involved in ergonomics either consciously or not. Ergonomics principles can be applied to the design and study of components in a working system that affects humans, machines, and the environment (Ray & Maiti, 2017).

Many organizations today have a correlation between resources (ergonomics tools), job description/demand, and employee well-being (Bakker & Demerouti 2007). Hence, this shows that ergonomics is involved in different spheres of life depending on the ramifications. Ergonomics is vast and can be found in tourism, warehousing, nature, banking sectors, gyms, housing, etc.

Ergonomics is a process of design or arrangement of a workplace, products, and systems that try to keep the capabilities and limitations of the workers in an organization in mind (Kiran, 2020).

There are also different types of ergonomics which include;

Firstly, physical ergonomics involves the human body responding to physical and physiological job demands. Secondly, organizational ergonomics examines the interaction between the organization and the system. Lastly, cognitive ergonomics studies the human brain how it interacts and processes information and how well a worker performs within that organizational environment (Orhan, 2023). All these types of ergonomics will be elucidated in chapter three.

1.1.1 Ergonomics in a retail environments (case study)

This case study focuses on Ergonomics and workplace design of a retail store(grocery store) with its physical presence in Pori, Finland. The company was established in the year 2014 and the online retail market store started in the year 2022 in Pori. The store serves as a warehouse where different products for sale are kept and customers from the

comfort of their homes buy those products through an online portal. The working environment in the store is conducive however, optimum satisfaction from the workers in the store using the ergonomics principle is a factor for this article being written. The case study aims to use ergonomics principles with the present layout of the store to make the working environment more conducive than it used to be.

1.2 Research question and objectives

For the research to be achieved, the keywords of the thesis topic were used to create the research question based on the problems or issues encountered at the retail store. In addition, the objective was borne out of what can be done to solve the problem (research question). In this research, three research questions and four objectives are to be done.

The research questions

1. What ergonomic element affects retail store workers productivity and comfort when they conduct repetitive jobs like stocking shelves and running to pick products?
2. What are some ways to minimize the risk of injuries and staff tiredness from the physical layout and architecture of retail stores?
3. What are the best ways to improve worker contentment, productivity, and general well-being in retail stores by using ergonomic principles?

The research objective

1. To enhance employee performance and improve task efficiency
2. To enhance safety and optimize store layout
3. To support employee well-being and to promote regular breaks, work less overtime, and reduce musculoskeletal disorder.

1.3 Definition and the limitations

1.3.1 Ergonomics

The term ergonomics is a Greek word coined out of ergonomos which means work and natural law. The International Ergonomics Association definition states that ergonomics

is an applied science discipline which focuses on designing and arranging tools people use in other that they can interact safely and efficiently (Kiran, 2020). For this research, the ergonomics will focus solely on the physical ergonomics coupled with organizational ergonomics. However, some parts will be cognitive ergonomics when it has to do with mental strain.

1.3.2 Work place design with a view on Retail (grocery) store

For the case study since the workplace is a warehouse, the research focuses on the design of a warehouse that befits a retail store. In organizations all around the world, there is a physical design that each of them has and this is a way of creating an appropriate environment or setting that matches suitable conditions for the workers (Zheng, 2023). The retail store is packed with shelves and aisles, a cold room and a lounge. The warehouse layout is an I-flow layout design.

There are two types of working environment, the organizational environment and the physical environment in any company. The latter include ranges of humidity, workplace design, and temperature (Salleh & Sukadarin, 2018). Since the thesis is about a physical store, the working environment is emphasized.

1.3.3 Limitation

The research gap in the theory background is conspicuous since people are adaptable and flexible and there is continuous learning, however, there are significant differences between individual persons. Differences such as strength and physical size are obvious, but other factors like differences in level of skills, styles, and cultural differences are not easily identified (Kim, 2015).

Considering that the thesis cuts across different types of ergonomics mentioned, the modus operandi is to generally use the necessary ergonomics terms when needed. In addition, the limitation that can be experienced in the study research in ergonomics and its load is a different perspective in a complex, socio-technical system that considers the human role as the key element in an interacting system and humans can be in-consistent (Wilson, 2000).

1.4 Research design

A qualitative research approach is used for this research study that allows a researcher to examine people's experiences in detail using a specific set of research methods that includes observation, content analysis, visual methods, histories/biographies and in-depth interviews. It is important to know that the qualitative approach method data set is not numerically detailed like the quantitative approach (Hennink, 2020).

For the case study, data is collected from a group of almost 30 participants of the retail store who are directly and indirectly involved in day-to-day activities. Individual and group interviews conducted will give a significant response since some individuals might be unresponsive during the group interview. The purpose of interviewing the worker is to have a variety of perspectives and opinions on the thesis topic (Seale et al., 2004).

1.5 Structure of the thesis

The structure of the thesis follows the general approach used in Univaasa. The overall goal is to compliment each chapter to fit together. The first chapter consists of an introduction, the objective and the research question of the case study. In addition, key definitions were defined, the research design explained and lastly the structure of the thesis.

The second chapter introduces the company's aims and background. The company's operation in Finland is explained and the past and present state of the company is partially mentioned. However, due to the non-disclosure of the agreement, the company name will not be mentioned.

The literature review is the third chapter where an in-depth review of the company's operation and the thesis topic were considered. Some of the topics include:

- Introduction to ergonomics in the retail work environment
- Ergonomics and worker productivity
- Minimizing injuries and fatigue through store layout

The fourth chapter is the methodology of the study that was conducted. Data are gathered from the participants at the store. These workers or personnel are considered the target group. All data are analyzed, checked, and reviewed.

Summary, results analysis, discussion and conclusion are found in chapters five and six. Suggestion on how the study can be further developed is considered.

2 Background of the company

2.1 Introduction of Company X

The thesis is written for a Finnish food delivery company with 12,000 workers around the world. The company was established ten years ago with a view of servicing customers in the comfort of their homes by having drivers as delivery agents. The company started their operation in Helsinki before spreading across the entirety of Finland. The company's growth was spontaneous, rapid, and technically viable. The company does not have physical offices around the cities but remotely operates over the Internet. Their initial focus was on food delivery where customers will order food through the company's dedicated phone or web application. Few years they diversified into an online market where goods are sold like the physical retail store.

The company's operation is embedded in Information technology where the customers will order through an application. Immediately after the order is sent from the customer's phone, it hits the dedicated tab of the restaurant of choice. The restaurant in turn will prepare the order of the customer and mark the food as ready. After marking the food/order ready, the courier driver gets a notification of the order for pick-up. The order picked up is delivered to the customer. This makes the operation a three-way communication with the company as the sole overseer and reviewer of all order that passes through the application.

2.2 The company retail store

The online market which is a retail store was established three years ago by company X and the management team was tasked to operate the new arm of the company. The development was to have a physical store located in different cities across Finland to serve the customers grocery products that can be found in bigger stores like K-market, Prisma, and Lidl.

The physical store is headed by a manager, one team leader and two shift leaders. The workers/associates working at the store are fifteen grocery associates and four call-in associates. In total, the number of personnel at the store is twenty-three people.

These people are in charge of operating the retail store by ordering from a supplier, getting the orders from them and shelving them. In addition, they are responsible for accepting orders from the customers, packing the order and giving the order to the courier partners.

The sole focus of the thesis research is based on the problems associated with the company retail store whereby their performance is impacted by ergonomics and workplace design. These two key factors are the major factor that influences the productivity of the store.



Figure 1: Depicting online grocery basket (Bhavna, 2021)

3 Theoretical background

3.1 Introduction to ergonomics in retail work environment

In every major workplace like the retail work environment, the operative posture at work is important to the organization. When a retail store worker is working for longer hours, static posture or repetitive tasks should be avoided since they cause cumulative health problems. To prevent these types of postures, Ergonomics is used to minimize such unnecessary repetitive tasks or static work (Kiran, 2020). It is important to have an ergonomic environment since many offices and industrial workers use human-machine systems like computers that can put strain on the eyes, Spreadsheet that can cause mental stress, and lifting and carrying objects that can cause physical injury (Kroemer & Grandjean, 1997).

Furthermore, ergonomics plays a crucial role in unconventional workplaces like retail stores since its principle applies to virtually every workplace. It is a general fact that retail workers in a full-time job in Finland work for eight hours. They spend long hours on their feet mostly in static positions at the checkout counters, shelving in the cold room, or moving heavy merchandise or products (Cozy, 2024). Some of the ergonomic interventions or impact on a retail work environment include:

- Using adjustable checkout counter to accommodate workers of different height, weight, and stature to reduce strain
- Recommended training like the health, safety, and environment where safe lifting techniques are taught
- Creating schedule that promotes adequate rest and recovery time
- Using anti-fatigue mats to reduce strain from prolong standing (Cozy, 2024).

Most retail employees can experience musculoskeletal disorders (MSDs) if activities such as stocking shelves, product lifting and customer interaction are frequent and repetitive. However, the intervention of ergonomics can significantly reduce injuries and also improve workplace efficiency (OSHA, 2019). In summary, a retail store is supposed to be well laid out and have the tools to help the worker do their jobs efficiently without incidences of injuries.



Figure 2. MSDs risk factor (Orhan, 2023)

3.1.1 Types of ergonomics in retail store

Ergonomics can be classified based on their application. There are three types of ergonomics and they are cognitive, organizational, and physical ergonomics (Kiran, 2020). The definition and meaning of each ergonomics are explained below with their application in a retail store.

- **Cognitive ergonomics:** This is a way the human brain interacts with and processes information. It is a determinant of how well a person can perform in a particular system like the retail store (Orhan, 2023). The mental workload, decision-making, work stress and skill-related performance are all mental processes which are the kind of work expected from a grocery worker (Kiran, 2020). Furthermore, the primary source of cognitive load is work and for a worker to be effective at working in a retail store, the cognitive ergonomics application must be readily available (Veteläinen, 2023). An example is having a signage or product sign on different aisles directing customers or consumers to the right products. In addition, tags and signage can help store workers know the right aisle that would need product shelving. In conclusion, cognitive ergonomics helps in operational efficiency.
- **Organizational ergonomics:** This is based on optimizing the sociotechnical system of an organization like the processes, structures and policies and it is also an interaction between the system and the organization (Orhan, 2023).
- **Physical ergonomics:** This is the biomechanical, physiological, and Anthropometrical information used in designing the workplace like the physical

environment. Where the environment is created to suit the workers (Salleh & Sukadarin, 2018).

3.1.2 Importance of ergonomics in work environment

According to Tumova et al. (2022) view, not complying with the ergonomic principle in a workplace like a retail store (Logistics specialists and managers) can negatively affect people's or workers' health. Thereby, significantly impacting the efficiency of the workers. Some of the importance highlighted by Tumova et al. (2022) is that the work environment should be adapted to employees and not vice versa and creates awareness that its principle can be used to sustain human well-being.

There are key benefits of ergonomics in a retail store since workers are engaged in physically demanding tasks like repetitive movement, and standing for longer shift hours. The ergonomic principle is used to improve the safety, comfort, and efficiency of work (Stanton, 2023). Some of the key benefits are listed below:

- I. Improved productivity: A poor ergonomic environment causes health issues for workers hence workers are less productive at work. There are many ergonomics principle that increases productivity and boost retail store key performance indicator (Material Handling Management, 2007).
- II. Cost reduction: Using the right ergonomic tools creates room for saving costs for the company. Tools that are necessary for a particular job when used can help to reduce time spent and eliminate MSDs that would cost the retail store management a fortune if workers are treated frequently by their occupational health (Markova et al, 2023).
- III. Reduction of musculoskeletal disorders (MSDs): According to Choi et al. (2017), When the right ergonomics training and seminars are organized for retail store workers, occupational risk factors such as bending, pulling and pushing heavy loads, awkward body posture while working, and reaching overhead are reduced and these factors mentioned above are the causes of work-related musculoskeletal disorders(WRMSDs).
- IV. Compliance with HSE: Organizations with robust health, safety, and environment(HSE) programs are generally prudent in their cost evaluation. It has been proven that participating in ergonomics intervention measures are the same or

effective HSE management styles that reduce death risk, workers' physical labour, and occupational injury. Some of the measures are promoting ergonomics tools and equipment for workers' activities, modifying tasks, providing safety training, and building frameworks and models for workers' optimum efficiency (Liao et al, 2023). The culture of safety is preserved and enhanced when ergonomic principles are used.

- V. Increased satisfaction: According to Wong & Richardson (2010), a survey carried out on two factories with ergonomics principles showed that improved ergonomic factors lead to better working conditions for factory workers. Thus, this leads to increased job satisfaction for the workers. Their intervention suggested that when the ergonomics rules are applied, it provides a better working environment that can optimize employee morale.

3.1.3 Common ergonomics challenges in retail store

There are ergonomics challenges faced by every organization and it is inevitable in a retail or grocery store. Many ergonomics challenges lead to less productivity, tiredness or fatigue, and MSDs. Some of these challenges include:

Repetitive motion: For this thesis, there is so much repetitive work done in the retail store. Repetitive motion can lead to ergonomic injury and this challenge is common in warehouses and stores, where products need to be offloaded and shelved (Kamat et al, 2017). Most of the work done in retail stores can lead to repetitive strain injuries.

Prolong standing: Many organizations or occupations require that the worker will be standing for a prolonged period of time and this mostly causes discomfort in the lower limbs and the back. The resultant effect of standing for longer hours is muscle discomfort and such injuries cause the absence of workers during their shift (Ramalingam et al, 2019).

Awkward posture: Retail workers bend, twist, reach and stretch for different activities performed in the stores like shelving, offloading, loading and distribution. The postures mentioned are hard for the body to perform and this awkward position causes stress to the muscles which usually results in pain and fatigue (Hambali et al, 2019).

Lifting and handling heavy object: According to Kamat et al, (2017), lifting can be defined as an activity of bringing or moving something upward from the ground. Lifting

requires some force and when proper lifting devices are not available, such work might be hard to do. Injuries occur from lifting heavy objects and when it is not also compatible with the retail worker. Lifting occurs regularly in warehouses or retail stores in the form of receiving, wrapping, storing, and shipping purposes. Working 8 hours long lifting either a light or heavy object can be a daunting task that can stress the body or wear the body out (Marras et al, 2006).

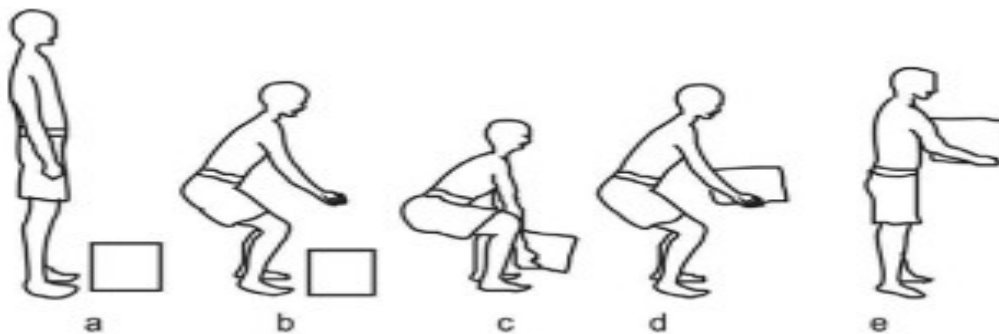


Figure 3. Illustration of proper lifting technique (Orhan, 2023)

Inadequate equipment or tools: Most grocery stores or retail store uses non-ergonomics tools like shelving carts, hand-held scanners, and pricing guns and these poorly designed tools can have adverse effects on retail workers' fingers, wrists, elbows, shoulders, and hands generally. When the management is not concerned about convenient tools, there are high chance that retail workers will quit their jobs.

Counters and checkout environment: Draicchio et al (2012), said that some counters and checkout workstations are fixed height and not ergonomically friendly, hence this makes the retail worker uncomfortable scanning, and interacting with the customer. If this kind of workstation is not upgraded, the retail store can lose workers to MSDs, and lack of motivation to quit the job.

3.2 Ergonomics and worker productivity

There is an interconnection between ergonomics and retail workers' productivity. For a worker to be efficient in their daily or routine activities, the management of the

organization must adhere to ergonomics improvement or principles. This ergonomic improvement will enhance the workers and make them efficient. In addition, there will be an increase in job satisfaction, less away time at work because of occupational health issues, and it will increase the retail worker's motivation (Veteläinen, 2023). Ergonomics does not only prevent injuries, it creates a working environment that is efficient, productive and effective for retail workers.

There are several ways that ergonomic principles set by the top management can help retail workers' productivity and these include:

- i. Less work-related injuries like back pain, joint stiffness, neck injuries and work-related musculoskeletal disorders (WRMSDs).
- ii. Fatigue and discomfort will be reduced with the number of absences reduced. In addition, pains that can cause discomfort are eliminated during repetitive work.
- iii. Cognitive mental focus is improved since knowledge skills are important in retail stores and this helps the workers to concentrate and reduces frustration from hard work.
- iv. Significant increase in job satisfaction will increase because ergonomics promotes a better working environment.
- v. Higher motivation
- vi. Decreases absenteeism
- vii. Reduces stress

3.2.1 Studies on ergonomics and productivity

Various studies have shown how ergonomics have increased workers' productivity. Firstly, according to Veteläinen (2023) in the thesis titled *The link between cognitive strain and ability to perform well*, said that there is a link that allows workers to perform better at knowledge work when the right ergonomics are applied. The author further said that when cognitive ergonomic tools and principles are applied, there is a greater boost in workers' productivity and this can also be related to retail workers.

Secondly, Stanton (2023) in the journal: *applying ergonomics*, said that worker safety is paramount and when the right ergonomic tools are used, there will be a significant decrease in fatigue and an increase in well-being which can boost worker productivity in any working environment.

Thirdly Kamat et al. (2017), said that repetitive work and heavy lifting activities of workers in any work environment can affect workers' health and this will impact their productivity at work. They suggested numerous solutions and one of them is how to position workers' bodies which is linked to ergonomics body posture. The body posture of a worker while working can either hurt him/her when wrongly positioned or can have a greater effect when ergonomic tools are well crafted and used in that work environment. Every right ergonomics posture can boost workers' productivity. In addition, Hambali et al (2019), mentioned that awkward posture can impact workers negatively when lifting a heavy object, and they suggested a solution of using Rapid Upper Limb Assessment (RULA).

Fourthly, Orhan (2023) in his book titled Ergonomics New Insights mentioned that human beings are still the focal point of any production or organization and for humans to be effective at work ergonomics needs to be introduced into that system. Any system that has ergonomics principles will have increased quality, effectiveness, and productivity.

Lastly, the author Adams (2017) who wrote production ergonomics states that if system designers like the organization management are not aware or mindful of various threats to health and the key performance index, this may result in sick leaves, injuries and fatigue, inefficiency, and production loss. However, when ergonomic principles are used by the organization, there is a sudden shift in their productivity percentages and this practice will sustain the working environment to be economically and socially stable. A good foundation in ergonomics can improve industrial workplaces like the retail store in Pori.

3.2.2 Factors impacting ergonomics and productivity

- i. **Workplace design:** There are numerous layouts and most organizations have a template of the type of physical footprint they need. Some of the top management choose the physical layout/place for the management with an expectation for the effect it will have on workers (Veitch, 2018). Furthermore, workplace design and its broader context can drive motivation for the workers in retail stores, physical layouts can reduce strain and increase efficiency for the workers and the

management (Karanika-Murray & Michaelides, 2015). Factors like proper chair design, shelve design and more can have impacts on the retail workers.

- ii. **Tools and equipment:** Pulling, pushing and using tools and equipment around the workplace can have a high shear force demand from the retail workers (Waters et al, 2011). Hence, ergonomically designed tools that can help the workers reduce physical strain must be used. Tools or equipment used around the store must be lightweight, easy to handle, and must not be complex to operate.
- iii. **Lighting:** In a working environment, lighting has a big impact on workers' well-being. The non-visual effect of light can not be emphasized enough since Gou et al (2023) stated in their research that light can affect the visual and non-visual ergonomics in workers. The research showed that light can have effects on mental health, sleep, and performance of workers. A properly lit retail store can reduce eye strain and discomfort from the workers and increase their focus and concentration on the job (Gou et al, 2023).
- iv. **Activity breaks and movement:** Taking breaks and changing posture impacts workers' body and mind positively. Prolonged sitting or standing while working without breaks can cause MSDs in retail workers/office workers (Sortino et al, 2024). Standing in a position for a lengthy period can cause back pain. Therefore, movement such as walking can help workers lower back (Gallagher et al, 2019). Breaks and movement can help retail workers avoid stiffness and fatigue. Stretching can also help with focus and improve the worker's effectiveness at work.
- v. **Training and awareness:** Emphasizing ergonomics training can help workers improve their ergonomics practice (Sirat et al, 2018). Educating workers periodically on ergonomics practices will improve their working conditions, enhance productivity, and reduce the risk of injury in the retail store.

3.3 Minimizing injuries and fatigue through store layout

The store layout which is also the shop floor environment is an important part of retailing business. This is where the major business activities occur. Retailing is made possible when the proper infrastructure is in place. Additionally, facility management plans the store layout which plays a crucial role in providing comfortable and a suitable environment for the workers. Furthermore, when ergonomics is introduced into the store

layout, human engineering(HE) is birth and HE is designing and arranging products that people/customers use to improve workplace productivity and safety (Gisi, 2023).

According to Gisi (2023), the author states that facilities such as a retail store layout have a significant effect on the quality and reliability of processes which in turn gives better productivity. The easier a store layout is understood by the workers, the less stressful it will be. Secondly, the author stipulated that a high level of technical cleanliness can make aisles and their surroundings clean which limits tripping or falling. And lastly, ergonomics in a broad sense, helps to address the human side of retail store management.

To minimize injuries and fatigue some key strategies can be used.

- i. **Ergonomics advantage:** Since ergonomics focuses on the best way for people to handle products and materials, it has been established that it minimizes fatigue, and discomfort and helps to avoid injury. There are five aspects that ergonomics focuses on which are: safety; comfort; productivity or performance; aesthetics; and ease of use. All five aspects are ergonomically related and this can significantly in one way or another order reduce the number of injury incidences and make workers less fatigued (Gisi, 2023). An example of an ergonomic advantage is placing frequently ordered products on shelves where stretching and bending would be avoided.
- ii. **Traffic flow:** When it comes to optimizing the traffic flow of how the retail store workers stock the shelves and retrieve the products for the customers, certain criteria are considered. According to Perrey & Spillecke (2013), not all square feet in a retail store are equal since there are high and low-traffic areas. A high-traffic area is ensured to have a wide aisle for easy navigation of workers and customers. This would ensure that workers are free from obstruction that can cause tripping or falling.
- iii. **Safety features:** If the safety feature of a retail store is prioritized, the risk of injury and fatigue will be minimized. Slips, trips, and falls can be prevented or reduced by different control strategies. One of the major layout attributes is to have an even floor/pavement surface throughout the retail store (Hughes & Ferrett, 2020).
- iv. **Employee task rotation:** When jobs are been rotated between workers at the retail store at regular intervals, it reduces the monotony of work which an individual is supposed to experience. Additionally, it helps to create the right employee job fit

which in reality helps workers avoid repetitive tasks over a longer period and makes them less fatigued and less prone to injuries (Helmold, 2021).

- v. **Design for rest opportunities:** The rest area is necessary for a retail store and helps workers to recover during shifts. The area must be comfortable so that it will encourage retail workers to go on break. This will reduce workers' prolonged standing and help reduce the risk of injuries and fatigue.

3.3.1 Ergonomics in store layout

For the layout to serve the workers better, some key principles need to be in the workplace. A retail store design must make navigation easy for both the workers and the customers. Firstly, the aisle width must be wide enough for the retail workers to be able to shelve all the required products. The store layout must be designed to encourage traffic flow. The common aisle width for most retail stores ranges from 0.9m to 1.22m (Ramsey & Ramsey, 2010). Secondly, is to create a well-planned pathway with signage to show the aisle and ease the traffic flow. Thirdly, the shelf height can be determined by the products/items that the retail stores sell (Düsterhöft et al, 2020). Lastly, the floor and lighting meet the management standards for safety and comfort.

3.3.2 Impact of architectural design in ergonomics

Architectural design is beyond aesthetics since human nature lies in their interaction with their environment. The design of a building space can influence human behaviour. Human behaviour can be influenced because human experience comprises cognitive, physical, and emotional aspects. A poorly designed architectural building can cause discomfort and health issues. An example is uneven floor, poor ventilation, and dim lighting (Aydemir & Jacoby, 2022). If a proper design is used with ergonomic principles from the management, it will enhance the worker's well-being.

Furthermore, retail management must emphasize their ergonomic plan ahead before starting the physical design that will suit the retail worker. According to Higuera-Trujillo et al (2021), they state that architectural design affects brain function and emotion. Their study research does not exclude retail stores and this shows that

ergonomics, when not implemented during the structural planning, can have adverse effects on the retail workers.

3.4 Ergonomics and workers well-being

In the modern world today, the key players in management know that human beings are the greatest assets. Humans as an asset are susceptible to losing strength and dwindling health either by aging or external stress. Due to this reason, ergonomics is introduced which is closely related to HSE in most organizations. Workers' well-being is a priority for any organization, hence some organizations now use a computational dynamic body map, in a bid to prevent WRMSDs (Oyinyechukwu et al, 2024).

Ergonomics has promoted workers' well-being by training workers on its principles and allowing workers to identify work hazards that can happen through repetitive tasks, awkward posture, and heavy lifting. It also recommends structures, physical, and cognitive abilities to tackle the former mentioned (Oyinyechukwu et al, 2024).

3.4.1 Tools and technologies in ergonomics

The Ergonomics approach has changed over the years using modern technologies and traditional knowledge combined to build tools and equipment to eliminate the risk experienced at workplaces like a retail store. Electronic tools are now adopted by many organizations and these tools or software applications help to create a conducive environment. In addition, it creates healthy conditions for retail workers and managers (Gasova et al, 2017).

Several tools have been researched by scholars in the field of ergonomics like engineering, science, industries, medicine, and environment. Some of these tool are:

First is the Virtual Reality (VR) based multi-player tool that is used to evaluate ergonomic postural risk, this tool, allows the observer to have a three-dimensional visualization of posture online and offline. It helps to know the risk involved in a repetitive task and can allow an observer or researcher to know what postural position will fit the job. Additionally, the VRBM can help to evaluate the ergonomics of a workstation in the design phase, allowing the management or the engineer, to tailor the design to be ergonomic friendly to the worker (Manghisi et al, 2022).

Secondly, is the use of wearable technologies like exoskeleton that serves as ergonomic tools to mitigate WRMSD. The exoskeleton helps to improve back, knee and shoulder support in retail workers where manual material handling is more common. The support reduces physical exertion like discomfort and improves ergonomic safety by eliminating the risk of pain and fatigue. The productivity of the workers can be improved with these ergonomic tools (Davoudi et al, 2024).

Thirdly, is the ergonomic workstations where tools and the environment are tailored towards human comfort-ability. The design is made in which the workstation will fit the workers rather than the workers fitting the workstation. Since humans are of different sizes and shapes, adjustable equipment and tools are used. An improper workstation can cause management loss either financially or human absenteeism from work (Stephens & Meyers, 2013).

Lastly, using the biomechanical modeling tools to understand the mechanism of muscle repetitive stress injuries (RSIs) in order to avoid injury. It is a practical tool for predicting injury risk and is also used to counteract factors that can lead to RSIs during work (Wan & Shan, 2016). This type of tool can help to predict and let workers avoid the risk of injury.

The tools mentioned are a few of the numerous tools that have been explored in ergonomics and they have proven to mitigate against MSDs and other related injuries that are associated with the work environment.

3.5 Conclusion of the literature review

From the literature review in chapter three, the importance of ergonomics can not be over-emphasized enough. It is an important subject of managing human/workers in an organization and preventing them from injuries and occupational health problems. Beer (!984), explains that humans/workers in an organization must be taken seriously since they are the asset for that establishment.

When ergonomics is applied in an organization like a retail store that has repetitive tasks as a daily routine, the productivity of the workers can greatly be influenced positively (Korhan, 2023).

My idea: Ergonomics in retail stores should not be neglected. The management should have bi-weekly staff training on the subject to equip their retail workers with the knowledge of what ergonomics can do for the organization and themselves. In addition, before any retail store is established, the management should plan with the HSE teams on how ergonomics can be implemented into the design of the facilities.

In summary, ergonomics in a retail store needs proper planning from the management, the principles implemented and developed from time to time by the training team. Lastly, the ergonomic tools that can help workers avoid fatigue, MSDs, and physical and cognitive stress must be used always to significantly increase the productivity level of the retail store workers. There is an observation from key findings that there are limited ergonomic write-ups based on retail stores. It is observed that numerous ergonomics journals are mostly medical fields. This gap leaves the researcher tailoring most of their findings from other fields that are related or not to fit their research.

4 Methodology of the study

In this chapter, the research methodology design of the thesis is discussed. Some of the discussed topics are research design that discusses whether the research is qualitative or quantitative, sample selection of the target group and the choice justification, data collection method used during the research, the data analysis on a plan to analyze the data gathered, ethical consideration of respecting workers privacy, and lastly, the limitation involved. In addition, the thesis methodology research can either be conducted inductively, deductively, or abductively.

4.1 Research design

In this part of the methodology, the discussion will be solely based on three sub-topics which are the research philosophy, research approach and the research method used. However, the definition of research design is important for a clearer view. Research design according to Cresswell and Guetterman (2019), defined research design as a Proposal or plan to conduct research in a way that will involve specific methods, strategies of inquiries, and intersection of philosophy. The sub-topic relationship with the research design definition will be expressed in the research sub-heading below.

4.1.1 Research philosophy

Research philosophy can be defined as a system of assumptions and beliefs about knowledge development, and how it is interpreted and understood. For research to be informative, the research philosophy must be outlined and should establish a strong justification for methodological choice (Saunders & Bristow, 2023). The research philosophy also helps in the sense that it aligns the researcher's method with their perspective and the research problem that is been encountered.

According to Veteläinen (2023) states that there are five philosophies in business and management research and they are:

- i. **Critical realism:** Its focus is to explain what the researcher sees and experiences concerning the underlying structure of reality and which forms the observable event.

- ii. **Positivism:** It is a way of generating accurate and unambiguous knowledge through fact-based data since fact has been proven not to be biased. It is a scientifically empirical way of working to get a strong point or result.
- iii. **Interpretivism:** It is a way of creating new and richer understanding and giving interpretation of the social world and context.
- iv. **Pragmatism:** Here, the view that concepts are relevant where they support action. For action to be carried out successfully, knowledge must be applied for that sole purpose.
- v. **Postmodernism:** This can be said to be the role of language and relation in which its goal is to question the accepted way of thinking by giving alternative or different perspectives of how things can be done (Veteläinen, 2023).

4.1.2 Research approach

Many researchers tend to write or choose their methodological approach after they have chosen the best research philosophy (Veteläinen, 2023). Saunders & Bristow (2023) states that three research approaches can be chosen which are: Inductive, deductive, and abductive approaches. The inductive approach is based on engaging in a detailed reading of data to gain a holistic understanding of it and also to ensure that important aspects of the data are captured (Azungah, 2018). The deductive approach is starting a research with theory and then in turn testing the hypothesis formed in the theory part and this is done in the research phase (Veteläinen, 2023) or can be said to be an approach that bases its analysis on past/existing theory that are from reputable institution (Azungah, 2018). Furthermore, this thesis research is based on the deductive approach in which the theory background is the first approach where the interview plan, group, methods and questions are formed and the result from the research is compared to the theoretical background. Lastly, the abductive approach is a mixed method and it consists of an inductive and deductive approach. The theory part generated from the abductive approach is only based on the research data collected.

4.1.3 Research method

There are three main types of research methods quantitative method, qualitative method, and mixed method. However, for this case study, qualitative research is used. Qualitative research is a method that has a non-numerical data and starts with a broad research question. Research questions in qualitative can be narrowed down when revised iteratively by the research purpose or aim. In addition, there are three methods used in qualitative research and they are interview of a group, focus group discussion, and observation from the participant (Denny & Weckesser, 2022).

Qualitative research is quite different from quantitative research since its purpose is not to establish statistical generalization (Veteläinen, 2023). Since the data collected from qualitative research is not fixed, it is data that continues till saturation is reached. However, the sample size for qualitative research is smaller compared to quantitative (Denny & Weckesser, 2022).

For this study, qualitative research fits into the purpose of knowing the issues and problems encountered by retail store workers when the subject of ergonomics is mentioned. The focus group participation will show if there is productivity or not based on the topic of this thesis. Lastly, observation and data from participants when compared to the literature review will make the researcher make a conclusion. Therefore, it is imperative to choose a qualitative research approach over the rest.

4.2 Sample selection

The sample size for the study consists of twenty-three people and the target group consist of one store manager, one team lead, two shift-leads, four on-call grocery associates, and fifteen permanent retail workers. Firstly, the store manager oversees the store management and attends meetings with other managers. The manager role is administrative and strictly commercial. Secondly, the team lead role is to act like a manager in the absence of the store manager and also delegate tasks to the shift leads. Thirdly, the role of the shift-lead is to control and direct the retail store workers both the permanent staff and the on-call associate. And lastly, the retail associate/on-call associate is the one who is responsible for working and doing the odd jobs within the store.

The reason for choosing this sample size and demographic characteristics is that it is accessible and in retail space data collection is manageable. Another reason is that ergonomics and HSE are lacking within the store. Although there are elements that are obviously in line with ergonomics the principle is rarely applied. In addition to this statement, there is different diversity in their jobs. The associate and shift-lead are the ones mostly doing the repetitive tasks, standing, shelving, and receiving inbound products from suppliers. The role of the store manager and the team lead is to oversee the layout of the store and keep up with the activities in the store by keeping records given to them by the shift leads.

4.3 Data collection method

For the data collection method three phases are involved, First and foremost is the first interview phase which is carried out to understand the issues encountered by the company when ergonomics as a topic is mentioned. During the first phase, two interviews were conducted. The manager and the team lead are interviewed to get a deeper understanding of cognitive ergonomics since their work entails more computer, management, and record keeping. The second interview in the first phase was also carried out for the shift leads and the grocery associate, however, the on-call associate declined the interview since they are outsourced company agents. In the second interview, many questions were asked regarding problems they encountered during repetitive work, shelving and so on. The first phase in a nutshell is to interview to identify the ergonomic problem that is encountered at the store.

The first phase is where questionnaires were distributed asking various questions that surround ergonomics like what ergonomic element affect their productivity, injuries the workers have encountered, what are the state of the worker's well-being, the performance index of the worker's productivity and so on.

The second phase is where direct observation of how the store layout affects tasks is conducted and the challenges the workers go through daily. This is the point where the store is visited to conduct measurements. Apart from the interview, the term GSTD was used to gather data at the store since the case study requires a physical presence to measure the aisle and height and if they meet the required standards.

Lastly, which is the third phase is giving the questionnaires back to the workers again after the first and the second phase to get their reaction to what it is after implementing ergonomics training and principles at the store. The interviews, survey and measurement were conducted physically. Some were conducted over the phone. The questionnaire distributed took one and a half weeks to gather all the responses from the workers at the store. All data were collected manually using pen and paper and also electronic tablet.

4.4 Data analysis and ethical consideration

For the data analysis, qualitative research is used for this case study and most of the data is analysed as non-numerical data. Qualitative research is much valued when it is conducted methodically and rigorously and yields a meaningful result. To get that meaningful result, a qualitative analysis is used. For qualitative research to be conducted in a consistent, precise, and exhaustive manner, a content analysis which is an example of qualitative analysis is adopted for this study (Nowell et al, 2017) A content analysis is an autonomous method used for varying level of abstraction and interpretation (Graneheim et al, 2017). The content analysis is used in quantifying the frequency of terms related to workers' well-being, injuries, fatigue and so on.

According to Veteläinen 2023, content analysis aims to have a deeper analysis for theoretical interpretation that can generate new knowledge. In addition, it is suitable for this study because different themes can be interpreted from the interview, and data would be defined clearly without being biased on the content that would be written.

For ethical considerations, no name would be mentioned and the privacy of all the workers at the store would be respected. All information processed is confidential with proper conduct aimed at gathering the maximum data.

4.5 Limitation

The trustworthiness of the study is limited since the first limitation is that the study is carried out in a store and this does not generalize what can happen in the other stores that are in retail business. More so, if there are two or more stores, there will be more data to execute and this might lead to the quantitative method. Secondly, the limitation is that the store is an online store and not a walk-in store like most traditional stores in

Finland. This limits the customer's ergonomic experience. Thirdly, some data are restricted due to privacy concerns and competitive reasons and due to this reason, some available data used are public, and those shared by the workers with parameters in place of what can be published and what can not. Fourthly, the retail store industry is a dynamic one. Research findings might be obsolete quickly, therefore a focus on the broader long-term trend is researched. Lastly, Resource constraint like budget, time, and access to some ergonomic tools opposes in-depth research that would have made the study clearer and richer in content.

5 Result and Analysis

For the result and analysis, the three phases of the data collection mentioned were used for the process and steps to the result. The first phase of interviews and questionnaires was to identify and know the kind of ergonomic problem that is experienced by the managers and the retail workers. The questionnaires distributed gave an insight that some of the workers did not know that the term ergonomics existed. The second phase is where practicals/research is carried out within the retail store floor using ergonomic tools and training to facilitate the store to its maximum potential positively. The second phase was the core study where workers were observed to see and know if ergonomics can help alleviate difficulties and answer some of the research questions. The last phase is the result questionnaire phase, where workers are asked to express their opinions about ergonomics before and after it is introduced.

The questionnaire gave an in-depth overview of how the performance of the workers was before the introduction of ergonomics, and the type of issues many of them encountered based on their health. For every aspect/area of the store, the issues encountered are mentioned, the ergonomic solution applied follows next and the resultant effect after it was applied would be mentioned in the subsequent sub-chapters that follow. Therefore, what the above statement implies is that: *Phase one is the problem phase. Phase two is steps to solution/process taken using ergonomic tools or principles. Phase three is the result of using ergonomics.*

5.1 The questionnaire

The demographic information shows the average age of the workers, the year the employees have worked at the store, and their roles respectively. Workplace ergonomics shows how often the workers get injuries and fatigue, and how comfortable the tools they use at work are. Workplace ergonomics also asks questions relating to workers' discomfort and how easy their movement is within the store. In addition, the questionnaire has a section called lifting and repetitive tasks where questions were asked about lifting and repetitive tasks like scanning and stocking shelves. The fourth section of the questionnaire is about breaks and support for the workers at work and how the management supports ergonomics. Lastly, is the suggestion on how ergonomics

at the retail store can be improved and what training can help to achieve ergonomic practices

5.2 Ergonomics knowledge

This is the knowledge needed to understand and apply the principle of ergonomics to every day-to-day activity in the retail store. This knowledge is inevitable for workers who do repetitive work and stand for longer hours. If there is no knowledge transfer from an expert in ergonomics or resources online to the workers, there might be setbacks caused by health issues and mental stress. The first thing done at the retail store was to ask questions about what the workers knew about ergonomics and how it is relevant to them.

5.2.1 Phase one

During the interview, it was observed that most of the retail workers and managers understood what HSE meant but when ergonomics as a subject was presented to them only a few had the knowledge and some only knew the term. Out of the 19 persons in the organization, only 1 person had a deep idea of what ergonomics meant, 3 persons understood the basics and the rest did not know or had never heard the term before. The quote “Knowledge is power” equates to adequate information to help resolve problems. The first problem in ergonomics in the store was identified and it was a lack of ergonomics knowledge.

5.2.2 Phase two

After identifying the first ergonomic problem, which is some of the retail workers have little or no idea of ergonomics. A 20-minute training in four sessions (1hr 20minutes) was organized to teach the fundamental principle of ergonomics. The reason for the four sessions is that the stores run two shifts in a day. The training introduced the workers, and managers to the meaning of ergonomics and where it is used. Most of them who had an idea thought that it is only used in the medical field: However, lectures were given on how there are different types of ergonomics and how it suits different types of organization. The training lecture was able to highlight the plight that the manager, team

leader, and shift leads suffer from cognitive stress. Moreover, the workers suffering from the physical and organizational lack of ergonomics were able to identify where they were ergonomically deficient. The cumbersome data and using a tool called merchant exposes the managers to bright light throughout the day. The workers were able to identify that lifting and pushing had been carried out in the wrong manner.

Some core aspects of ergonomics training were thought like HSE (Health, safety, and environment), cognitive ergonomics (mental processes like using software tools that help like ChatGPT), and Environmental ergonomics to deal with noise temperature and lighting.

5.2.3 Phase three

After the short training, the exercises to be done around the store were well understood by all the 19 workers. The questionnaire given to them after the training suggests that the participants understand the basics. Around 10 of them agree that there is something that has been done wrongly within the store premises when ergonomics is concerned. 4 were indifferent about the situation and believed that ergonomics might not service their needs and still hope that the old way of doing things is better. The rest were indifferent, they thought it might and might not be a long-term solution based on the fact that they hardly hold meetings and training aside from the recruitment period. The interest of the retail workers was on how the ergonomic principle would alleviate their stress from long days at work, motivate them and make them productive, this led to the next research on how the products were placed within the store.

5.3 Ergonomic product placement

For retail workers not to be stressed during their shift periods, fast-moving consumer goods need to be placed in conspicuous places. FMCG are those goods that are in higher demand from the customers. These goods might not be the most important or expensive of all the goods. However, they are easier to create slow and long traffic for the workers when not placed in a good spot.

5.3.1 Phase one

For this phase, the majority of retail workers pinpointed some of the FMCG that is sold at the store through the questionnaire. The products are kept in two areas of the store. The first area is the shopping floor area and the second one is in the cold room.

The employee at the store stated that chocolates, chips, energy drinks, milk, cheese, minced meat, chicken, pizzas and sausages are FMCG and some of these goods are kept within the aisle in the store and hardly find some of them. The cold products, are kept in the cold room and might take some time inside the fridge to get the products for packaging to send to customers. The time used for picking the products is longer than expected sometimes.

5.3.2 Phase two

In this solution phase, since the store is not a walk-in store where customers visit, suggestions were made that the FMCG be placed at the front of the store. The first thing was to dedicate a fridge solely to energy drinks and cold protein shakes beside the packaging counter. 2 volunteers agreed to help reshuffle other drink products from one fridge to the other till we were left with energy drinks in just a fridge. Furthermore, close the packaging counter, we decided to move the chocolates and chips from the middle store to the front of the store. For the cold room products, all that was done was bring all the pizzas, milk, cheese, chicken, minced meat and ready food closer to the door of the cold room. This allows the workers to find the products easily and spend less time in the cold room.

The exchanges and work for the research were done within a few hours and the retail workers were able to compare the old product placement to the new one within a few days.

5.3.3 Phase three

After the solution phase, 12 workers out of 15 agreed that FMCG placed at the front of the store and close to the cold room door helped to reduce time spent looking for products and reduced aimless walking around which causes stress. 3 were indifferent

since they believed that they already knew where to go get the products before and thought the research was pointless in their view.

5.4 Ergonomic workplace design

This has to do with layout, the architecture, the floor plan and how the shelving has helped the workers. The design within the store has been a little hassle owing to the reason that it's not a walk-in store. Therefore, some of the standards were neglected. It is expected that an organisational environment must fit the worker's task and be conducive (Zheng, 2023).

5.4.1 Phase one

All of the questionnaire respondents agreed that the store did not follow the standards of a traditional store since its retailing and customer experience are solely online. Due to lack of customer presence, the store was jam-packed to the edges and sometimes products are placed in wrong places. The aisle width, the gondola shelf height and all are not strictly followed because the management wants to maximize the space. This impedes movement and does not allow some workers to be able to push product carts easily. Some of the workers admitted that they had tripped because of the aisle width which is not up to a metre.

5.4.2 Phase two

The research at this phase was limited due to the company policy and discussion was arranged with the manager, team lead and shift leads. The limitation of the research was caused because the company was trading in large amounts of goods and services and their space was limited. This large amount of product from suppliers caused congestion in the store. The retail store leaders agree that for ergonomics to work and the place to adhere to ergonomic principles, decongestion must take place and the floor and plan need to follow the traditional retail store standards.

5.4.3 Phase three

All agreed that the retail workplace design is poorly designed, however, if the store is not congested, there would be less stress and worry of sustaining injury or tripping. Though there have never been any accidents at the store near-miss incidences have been reported by one or more workers.

5.5 Ergonomic tools

Observation and research at the store gave the researcher a deeper understanding of how ergonomic tools can be of great importance to the retail workers and the managers at the store. There have been productivity, however, it has been impeded by not using the right ergonomic tools. Using ergonomic tools is essential for most organizations and creates a better working environment (Gasova et al, 2017).

5.5.1 Phase one

A significant number of the workers reported through the questionnaire that there have been many incidences of wrist and thumb issues because of scanning inbound goods and handling the scanner for a long time. Others reported back pain when at work due to the longer periods of standing. The majority of the worker think that there is little or no solution for this since their job requires them to stand for the whole of their shift. This has left many calling in sick and visiting the occupational practitioners for their WRMSDs. The managers complained about stress on their eyes because of the brightness of the computer system they use.

5.5.2 Phase two

The first approach to solve the problem in phase one was to identify tools that can help at the store. Four cheap tools were purchased through the Temu online store. The tools were a finger scanner, a back strap, a power knee joint support, and a computer screen protector.

One worker at every shift agreed to use the first three tools and the managers used the computer screen protector on a computer out of the 3 computers available to them.

After a week of using the tools, it was observed that the people who used the finger scanners were quite fast in receiving goods and preparing a pick-up order. Those who used the back strap and the power knee joint support said they felt relieved and motivated to be at work because they were less strained from stretching and reaching heights. For the managers, using the computer screen protector, greatly reduced the flickering from the screen and put less strain on their eyes without adjusting the computer screen to fit individuals. In addition, from the ergonomics training, it is essential to look at the screen for just 20 minutes and then look away for 20 seconds to help the eyes from stress.

5.5.3 Phase three

The manager agreed that for the worker to be more productive, the company needs to get ergonomic tools that are needed. An ergonomic tool as an alternative made those who volunteered to use them to be more productive and resilient at work. The manager and others accepted that there may be a tool meant for a job but might not be ergonomically friendly and cause problem for the retail worker. In addition, The shift leads mentioned that the desktop computer that had the screen protector became the most used because it suits everyone without adjusting the colours.

5.6 Ergonomic job rotation

At the store, there is no systematic practice of moving retail workers between different work areas and job tasks at intervals. This causes the worker to spend prolonged hours doing the same repetitive task. Owing to repetitive tasks, some of the workers have sustained injury and other sort of illness within the store.

5.6.1 Phase one

All of the workers during the interview complained that lack of task direction causes confusion and grudges among the workers. One of the causes of the grudges and causes of flu is the cold room and many workers avoid this area. Another task not palatable for the workers is receiving cold items because of their short shelf life when they melt. Due to the short life, many workers burnout trying to receive the items as quickly as they can.

Lastly, picking the products for delivery has also not been easy whenever there is a large order. There have been complaints that the basket size hurts the arm or wrist when picking the products. Shoulder and wrist pain have often been mentioned to the manager as the cause of absenteeism.

5.6.2 Phase two

First, the decision was to create an hourly rotational schedule for the retail workers. Most of these workers know their job roles, however, some lack the understanding and have no guts to ask other workers to change workstations. The first rotational problem tackled was the cold room situation where some of the workers spent 2 hours or more. The rotation was implemented for 45 minutes at a time and this motivated the workers to take that task as their first point of call and never go there for the rest of the day, except when picking orders. The task rotation helped the workers spend less time in the cold room and made them productive in collecting the product faster. Secondly, the manager whenever the cold items would be supplied agreed to invite one of the on-call grocery associates and this helped in reducing the stress of running for the ice-cold item not to defrost. Lastly, instructions were given that for large basket sizes, the smaller basket sizes can be neglected and attended to later. This allows the workers to collectively do the task together without having to carry a heavy load.

5.6.3 Phase three

All the workers were satisfied with the decision of the manager for the task rotational schedule and all agreed that they became more productive after the researcher and the manager came up with the plans. The shift-leads had more time to attend to paperwork and fewer blue-collar tasks. 14 out of the 15 respondents who answered the questionnaire said they feel less stressed when they rotate tasks. All of the respondents also agreed that task rotation makes work engagement quite easy and increases their well-being. For the 3 weeks of research, no one reported physical strain to the manager, team lead or shift lead.

5.7 The managers report

The report from the manager suggested that the use of ergonomic practices helped in the area of occupational health. The monthly report for October - November, showed that there were only 2 persons who called in sick due to back pain and muscle strain. This was the lowest such occurrence in the year 2024 and the inception of the store in Pori. In addition, the KPI like picking time, time of receiving products and time spent in the cold room, significantly decreased.

6 Summary and conclusion

To summarize the study, the research questions are first considered to know if the questions are answered using the data collected. Secondly is to know if the data collection method and literature can be linked to the objective of the study. For the aspect of conclusion, the idea behind the research is mentioned and what is the future development of the study. The research question was further expatiated for clarity and objective explained for in depth knowledge.

6.1.1 The research question addressed

There are three research question that was addressed and from the question the first one is:

- i. The ergonomic element that are in the store, some of the element are not suitable for the workers and an example is the work station design like the shelves and aisle width. Another ergonomic element that is lacking before the training took place was manual handling and lifting. Most workers in a rush to do their daily task, use a poor technique of lifting and this has caused MSDs within the store. Lastly, is prolong standing, where most of the workers doing same repetitive jobs.
- ii. Through the study in chapter five, the second phase which is the troubleshooting phase, was able to proffer solution in minimizing the risk of injuries by using ergonomic tools, ergonomic training. For minimizing staff tiredness, a rotational task was a solution and product placement where it would be easily accessible and would not allow workers to move around the store aimlessly.
- iii. For the third question, some of the best way that improve worker contentment, productivity, and general well-being include optimizing workstation, implementing job rotation and more. This way to improve all can be found in chapter 5 of this case study.

6.1.2 The Objective of the study addressed

- i. Did ergonomics enhances employee performance and improve task efficiency?

Answer: In this case study, most especially in chapter 5 the observation during the research highlighted that retail workers want an environment that fits them and not them fitting into it. Thus, workers are motivated to work better in a suitable environment. The knowledge and cognitive ergonomics application make the worker task efficient.

ii. Did ergonomics enhanced safety and optimize store layout?

Answer: For this study, safety was enhanced because ergonomic knowledge on different aspects of health, safety and environment was taught during the training and this equipped the employee with a considerable knowledge of safety and where it is applicable. However, the same is not true for the store layout due to the company policy that took advantage of no walk-in customers and decided not to follow the basic standard of a traditional store.

iii. Did ergonomic support workers well-being, Promote regular breaks, Work less overtime, and reduce MSDs?

Answer: The data gathered from the questionnaire after phase two of every ergonomics principle used, the data showed that 16 out of 19 agreed that ergonomics is important to their well-being. For the regular breaks, the company already have a stipulated time for breaks. Therefore, this area of study was not researched but the break interval suits the workers and the same thing for the working less overtime. Lastly, for the MSDs, the data gathered from the manager's report for the month of the ergonomic exercise, and occupational report on MSD was significantly reduced. This shows that the study was positive in reducing stress and strain causing MSDs.

6.2 Linking the data collection and literature to objective

Rose et al. (2014), explain that the existing literature is the foundation of every author's idea. The idea of an author is based on developing existing ideas and infusing their own to create a solution to a problem. In this case study, the literature on ergonomics is vast but for this study, it was narrowed to a retail store. The idea behind the study was to help alleviate issues experienced by retail workers when doing repetitive tasks. The ergonomic principle in the literature was used to create questionnaires and the questions were designed for retail store employees. The questionnaire served as a data collection method which represented the first-hand information of the workers. The

information/data on ergonomics the workers gave during the research gave rise to the processes of finding solutions to them. Thus, using the existing literature review solution of other authors was relied on during the study with the idea of making work life easier for the retail employee. The objective of this study from the onset was to make work life easier by enhancing performance and task efficiency, supporting safety and improving the store layout. All the data gathered are in line with what ergonomic solutions can do and provide.

6.3 Future research

The future for ergonomics is never-ending because it is a vast subject that can still be further explored. This case study has its limitations and one of the major ones is that research is only done in a store and not a traditional store where customers walk in and purchase their products. The sample size is small but for future studies, the sample size can be increased to include retail stores across Finland. This will allow a proper comparison and establish the fact if the study is viable in its findings or not.

Another aspect of the study that was not examined was the cultural/demographic aspect. Researching the ergonomic effect in a retail store in different cultural backgrounds might yield different results compared to the Finnish culture tested. Some cultures believe in respecting elders at work and in such cultures, rotational tasks might not be effective. Another limitation of the study is that properly trained ergonomist practitioners are not involved and this can be developed or done in future research since an ergonomist would be able to suggest and give the right advice during the research.

This studies, it cuts across different types of ergonomics within the store without any emerging trends. However, future studies can explore emerging trends like AI which is a tool that can also help in the aspect of ergonomics. Lastly, one of the limitations of this is the limited articles and journals written about ergonomics in retail or grocery stores.

6.4 Conclusion

For this study, the research was done to understand how ergonomics and workplace design enhance employee productivity in a retail or grocery store. The impact ergonomics have on workers' satisfaction and how it motivates them to work. In the

research that was done in a store, the findings are advantageous and implementing ergonomics in any form in a retail store, reduces stress, fatigue, and MSDs.

The suggestion on these findings is that it should be a priority of any management that deals with retailing to implement ergonomics in their stores, This can be done by giving necessary training and seminars by a qualified ergonomist and this training should be done regularly. Furthermore, companies should invest in ergonomics tools for their employee since organizational ergonomics is important. These tools would help to alleviate pain, and fatigue, and make the work of the employee easy.

The existing ergonomics literature review is vast, however, ergonomic topics in retail stores are quite few in number. This research has contributed to the literature on ergonomics in retail stores using on-field ergonomic practicals to solve pressing issues in a retail setting environment. This literature can further be developed by researchers who are interested in ergonomics most especially those targeting retail stores and warehouse environments.

As the world continues to advance and evolve daily, ergonomics practice and application will keep playing a crucial role in many organizations that are willing to invest in it. The more the knowledge of ergonomics in the present world, the further the likes of stress, burnout, fatigue and MSDs would be isolated from our working environment. The future of ergonomics can not be exhausted but it will keep evolving and merging with HSE in banking, retail stores, stadiums and even in our homes.

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