# ERGONOMIC ASSESSMENT OF CASHIERS AT CHECKOUT COUNTERS OF SELECTED RETAIL STORES IN VADODARA CITY

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# ERGONOMIC ASSESSMENT OF CASHIERS AT CHECKOUT COUNTERS OF SELECTED RETAIL STORES IN VADODARA CITY

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# *Introduction*

# CHAPTER - I

# INTRODUCTION

Retailing in India is one of the pillars of Indian economy (McKinsey, 2007). India is the world's fifth-largest global destination in the retail space. It accounts for over 10 per cent of the country's Gross Domestic Product (GDP) and around 8 per cent of the employment (IBEF, 2019).

According to Kotler and Armstrong (2016), A retailer or retail store is a business enterprise whose primary source of selling comes from retailing. Retailing includes all the activities involved in selling of products or services directly to final consumers for personal, non-business use. The important types of retail stores are: "Specialty Store", "Department Store", "Super Market", "Convenience Store", "Discount store", "Off-Price Retailer", "Superstore", "Hypermarket" and "Catalogue Showroom" (Kotler and Armstrong, 2016). A team of several workers are involved in these retail stores such as cashier, sales associate, store manager, cleaning and maintenance worker, security guard, team leader and floor manager (Comentale et.al. 2018). These workers play a very important role in the retail stores, without these workers the retail stores are can't be alive. Moreover, they play a very important role in buyer-seller interactions. To make buyer-seller interactions successful it is important to take care of their work-related discomforts which may lead to reduction in their productivity or productive efficiency.

## Cashiers

In one form or another, cashiers have been around for thousands of years. In many businesses, such as retail stores, the cashier is a "stepping stone" position. Many employers require employees to be cashiers in order to move up to customer service or other positions (Wang, 2012). A retail cashier or simply a cashier is a person who handles the cash register at various locations such as the point of sale in a retail store. In a shop a cashier is a person who scans the goods through a cash register than the customer wishes to purchase at the retail

store. The products are scanned by a barcode positioned on the product with the use of a laser scanner. After all of the goods have been scanned, the cashier then collects the payments (in cash, cheque and/or by credit /debit card) for the goods and services exchanged, records the amount received, makes change, and issues receipts or tickets to customers. Cashiers records amounts received and may prepare reports of transactions, reads and record totals shown on cash register tape and verify against cash on hand. A cashier may be required to know value and features of items for which money is received, it may be cash checks, may give cash refunds or issue credit memorandums to customers for returned merchandise and may operate ticket dispensing machines (Lawless, 2014). The major tasks of the cashiers include barcode scanning, receiving money, billing, reaching for items, getting a bag and bagging. All these tasks are carried out by them in standing position. The working time of the cashiers of the stores is 8-9 hours per day.

**Environmental Parameter at checkout counters**

The place in retail stores where the cashiers work is termed as checkout counters. It had a cash box, display unit, keyboard unit in front of the cashier. The work environment of a checkout counter has an impact on the cashiers (Kihlstedt and Hagg, 2011). Every retail stores have various number of counters in which the cashiers performs their job. As illumination, noise, temperature and humidity are important environmental parameters of indoor workplace, therefore the workplace of the cashier's i.e the checkout counters should have proper environment to make the work of the cashiers efficient.

The indoor environmental factors like **noise**, arrangement of the machines and tools along with the nature of the tasks collectively affect the workers. Noise may be external, coming from outside the building, or internal, generated within the building itself. The sources of external noise in a retail store can be traffic, industry and neighbours depending on the location of the store. In addition, the retail shops have its own internal noise which comes from telephones, computer keyboards, music players and people walking and talking. The recommended

level of noise at retail stores was 50 to 60 dB (Rangwala, 2014). Strong and repeated stimulation by intense sound can lead to loss of hearing, which is only temporary at first but after being ‘deafened’ repeatedly some permanent damage may occur. This is called noise-induced hearing loss (NIHL) and is usually brought about by slow but progressive degeneration of the sound-sensitive cells of the inner ear. The more intense the noise, and the more often it is repeated, the greater the damage to hearing. Retail stores have been provided with a different kind of music which is persistent but very quiet, unobtrusive, hardly impinging on the consciousness. This is called ‘background’ or ‘wallpaper music’ or ‘muzak’, meant to surround one with a pleasant sound. It should have the advantage of not being distracting and therefore being suitable for work. But if the music is loud then it would be unfavorable to the workers. (Kroemer and Grandjean, 1997).

Moreover, **Illumination** influences the performance of different tasks in different ways. The greater the contribution of vision to the performance of a task, the greater will be the effect of illumination on that task. A very high level of illumination is often unsuitable in practice. Levels above 1000 lux increase the risk of troublesome reflections, deep shadows and excessive contrasts. The distribution of luminance of large surfaces in the visual environment is of crucial importance for both visual comfort and visibility. In general, the higher the ratio of change or difference in luminance levels, the greater the loss in comfort and visibility. Inadequate lights or illumination arrangements can be sources of glare which make viewing difficult and uncomfortable. There are two types of glare that can make visual work difficult or impossible. Direct glare occurs when the eyes look directly into a light source. Indirect glare is reflected from a surface into the eyes. Both kinds can be avoided by proper ergonomic measures (Kroemer and Grandjean, 1997). According to Chauhan (2016), the recommended level of illumination for retail stores was 500lux.

Along with noise and illumination, **temperature and humidity** also affect the workers. Thermal comfort describes a person’s state of mind in terms of whether

they feel too hot or too cold. It is defined as that condition of mind which expresses satisfaction with the thermal environment. Environmental factors (such as humidity and sources of heat in the workplace) combine with personal factors (such as clothing and how physically demanding the work) to influence what is called 'thermal comfort'. Thermal environment may contribute to the overall health and well-being of the employee and the well-being of the organization. Poorly managed thermal environment may cause absenteeism, turnover of staff and complaints. If a person's thermally comfortable this can increase employee motivation, productivity and quality of output (Ruslan et al, 2014).

The effect of atmospheric **humidity** was prominent in early research by Koch et al. (1990) and Nevins et al. (1966) shown that after a prolonged stay in the same room, the impression of temperature is little affected by the humidity of air. The combinations of relative humidity (RH, in per cent) and air temperature produce equal effective temperature, 70 per cent RH and 20$^{o}$C, 50 per cent RH and 20.5$^{o}$C and 30 per cent RH and 21$^{o}$C (Kroemer and Grandjean, 1977).

**Physiological and Psychological Health Problems of Cashiers**

Physiological health problems is normally caused when the normal or proper functioning of the body is affected because the body organs have malfunctioned, not working or the actual cellular structures have changed over a period of time causing illness (Caballero et.al, 2017). Physiological health problems can be caused due to several environmental factors such as noise, illumination and temperature and humidity. Inappropriate illumination at the workplace can cause eye strain, blurred vision, red or pink eyes, burning of eyes, light sensitive, dry eyes and headaches (Goines, 2007). Prolong exposure to loud noise can cause impaired hearing. Since, the cashiers of the retail stores work about 9 hours in a day and to avoid such noise damage Grandjean (1988) proposed as a limiting value the $L_{eq}$ for an 8 hour day not to exceed 85 dB ( Kroemer and Grandjean, 1997). Moreover, air temperature and humidity may also affect the physiological health of the cashiers. Extreme temperature and humidity can leads to muscle fatigue, fainting and heat exhaustion and lower temperature and humidity can

cause numbness, dry skin, dry eyes, dry throat, nasal blockage, bleeding nose and coughing (Grandjean, 1997; Hoppe, 1998; Ismail et.al, 2007).

Psychological health refers to cognitive, behavioral and emotional well-being (Newman, 2017). Research has shown that the physical environment may affect the level of mental fatigue people encounter. People expose to inappropriate illumination, temperature, humidity and loud noise for a longer period of time may cause or contribute to the following adverse effects like anxiety, stress, nervousness, nausea, emotional instability, argumentativeness, sexual impotence, change in moods, increase in social conflicts, anger, distraction, hysteria and psychosis (Goines, 2007).

**Musculoskeletal Discomforts among Cashiers**

Musculoskeletal Discomforts were recognized as having occupational etiologic factors as early as the beginning of the 8$^{th}$ century. The musculoskeletal discomfort refers to pain in the muscles, ligaments and tendons and sometimes entire body ache. The economic loss due to such discomforts affects not only the individual but also the organization and the society as a whole (Ardahan and Simsek, 2016). Work-related musculoskeletal discomforts (WMSDs) are type of discomforts that affect different parts of the body that are associated with movement, including the upper limbs, lower limbs and back. These affect the different structures of the body such as tendons, joints, muscles and nerves and are primarily caused or aggravated by work-related activities (Nunes and Bush, 2012). Work-related musculoskeletal discomforts bring about a lot of harmful effects. Moreover, people who experience these discomforts suffer mentally and physically and are faced with the possibility of permanent, partial or total disability (Maligaya et al. 2011). The musculoskeletal discomforts can be assessed by standardized questionnaires viz. Nordic Musculoskeletal Questionnaire (NMQ) and Cornell Musculoskeletal Discomfort Questionnaire (CMDQ). Experiencing these discomforts in different body parts for a longer period of time may lead to musculoskeletal disorders. These condition result functional impairment and may

affect back, neck, shoulders, elbows, forearms, wrists, hands, ankles and feet (Buckle and Devereux, 2002).

There are numerous reports in the literature of serious musculoskeletal disorders, upper limb disorders, repetitive stress injuries and cumulative trauma disorders among cashiers (Baron et al. 1991, Harber et al. 1992, Bonfigliolietal, 2007, Barbieri et al. 2013). Such disorders are mainly due to the high degree of repetitiveness and monotony of the cashiers work resulting from long work shifts and related to ergonomic factors such as the design of laser scanner checkout systems (Wilson and Grey, 1984) or to psycho physiological stress and work techniques (Lundberg, 1999).

If was found through preliminary survey that cashiers at checkout counters were working in standing position throughout their shift. They were also subjected to repetitive tasks and awkward postures. Due to these repetitive tasks and awkward postures they may develop neck-shoulder pain, carpal tunnel syndrome and back pain (Maligaya et al. 2011) which as a result absenteeism and low productivity increases. Therefore, it becomes imperative to reduce such problems for a productive and safe work environment.

The present study highlights some physiological and psychological health problems and discomforts experienced by the cashiers of retail stores. The environment viz. Lighting, Noise, Temperature and Humidity of the checkout counter of the cashiers were also assessed. The results of the study will help the designers of checkout counters of retail stores to consider the physiological and psychological health problems and discomforts experienced by cashiers while designing them. They can also take into account the minimum standards laid for designing the environment at checkout counters. The outcome of the research will also wrench the attention of the retails store authorities to contemplate the health problems and discomforts of their employees considering which can reduce absenteeism and increase productivity.

## Justification

Vadodara is one of the important city in terms of trade in Gujarat. There are many retail stores in the city of Vadodara. Thus, shopping in Vadodara attracts a huge number of tourists to plan a visit to the city. Due to this increasing number of stores more employment is generated. Many employees are engaged in these retail stores to provide services to the customers. The cashiers play a very important role in buyer-seller interactions. The review of literature revealed that the environmental parameters of the workplace of the cashiers such as noise, illumination, humidity and temperature have impact on the workers physiological and psychological health which reduces their productivity. Therefore, the present research aims to study the environmental parameters viz. noise, illumination, temperature and humidity at the checkout counters of the cashiers.

Moreover, the cashiers use to work in standing position for their entire shift i.e 8 to 9 hours a day. They further have to perform repetitive movements of hands and legs while standing. Working under such condition for longer period of time might affect the physiological and psychological health of the cashiers. Therefore, the present study aims to study the extent of physiological and psychological health problems experienced by the cashiers of selected retail stores. The literature reviewed reflected that checkout cashier's work has been associated with high rates of musculoskeletal discomforts. Researches related to discomforts of checkout cashiers were conducted in foreign countries as reflected through literature reviewed. In majority of Indian retail stores, the cashiers work in standing position throughout their entire shift which might increase the risk of musculoskeletal discomforts leading to musculoskeletal disorders. Therefore, the present study attempts to find out the discomforts experienced by the cashiers of selected retail stores.

Several studies were found through review of literature focusing on areas such as "Checkout counter design of cashiers" (Kihlstedt and Hagg, 2011; Adlakha, 2018), "Musculoskeletal disorders among cashiers" (Forcier et al, 2008; Lehman et al, 2010; Rissen et al, 2010; Capodaglio, 2017; Zuhaidi and Rahman, 2017 ),

“Environmental factors at checkout counters” (Ismail et al, 2007; Maligaya et al, 2011; Patel and Karmakar, 2013; Osman et al, 2014; Sajiyo and Prasnowo, 2017; Musa et al, 2018). Related studies have been conducted in past in the Department of Family and Community Resource Management on areas such as Work Posture Analysis and Musculoskeletal Problems (Datar, 2003; Krishna, 2006), Ergonomic Assessment of Workload in critical activities (Agarwal, 2004), Ergonomic Assessment and modification of technologies (Chauhan, 2005), Noise Level and its effects (Saloni Parikh, 2011). A dearth of researches were found in India focusing on finding out the extent of physiological and psychological health problems experienced by the cashiers due to selected environmental parameters, assessing environmental parameters at the checkout counters and discomfort experienced by the cashier of the retail stores.

The Department of Family and Community Resource Management, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda, offers courses on “Consumer Ergonomics” and “Ergonomic” at Master’s level. Hence, the information gathered through the present research would widen the data base and will help in strengthening the curriculum. Moreover, it will also help the students of Family and Community Resource Management to gain insight into the area of ergonomics related to physiological and psychological health problems caused by the environmental parameters viz. noise, illumination, temperature and humidity, work-related discomforts caused by repetitive tasks and awkward postures of the cashiers. The results of the present study are expected to contribute significantly to the field of Family and Community Resource Management as well as it will contribute for the society at large.

**Statement of the problem**

The present research study aims to assess the environmental parameters at the checkout counters of the cashiers, extent of physiological and psychological health problems experienced by cashiers and discomforts experienced by the cashiers of selected retail stores.

## Objectives of the study

1. To assess the environmental parameters at the checkout counters of selected retail stores.
2. To find out the extent of physiological and psychological health problems experienced by cashiers due to selected environmental parameters viz. noise, illumination, temperature and humidity at checkout counters of selected retail stores.
3. To assess the discomfort experienced by the cashiers of selected retail stores.
4. To suggest ergonomic tips for
    a) Reducing discomfort.
    b) Improving environmental parameters of the cashiers.

## Delimitation

The study was limited to those cashiers who had worked as cashiers in the retail stores for minimum 12 months.

## Hypotheses of the study

1. There exists a relationship between extent of physiological and psychological health problems experienced by the cashiers due to selected environmental parameters with selected personal variables of the respondents.
2. There exists a relationship between discomforts experienced by the cashiers during last 12 months with selected personal variables of the respondents.
3. There exists a relationship between the extent of health problems experienced by the cashiers due to noise and illumination and selected environmental parameters viz. noise and illumination.
4. There exists a relationship between the discomforts experienced by the cashiers during last 12 months and discomforts that prevented them from carrying out their normal activities during last 12 months.

# Review of literature

# CHAPTER - II

# REVIEW OF LITERATURE

The review of literature is a condensed version of an exhaustive literature survey (Kamath & Udipi, 2010). The reviewed literature provides the basis to understand the importance of undertaking research in the chosen area to obtain knowledge on the methodology used in past researches and to identify the need for future research (Kothari, 2012). The main aim of the present research is to assess the environmental parameters viz. noise, illumination, temperature and humidity at the checkout counters of selected retail stores, to find out the extent of physiological and psychological health problems experienced by cashiers of selected retail stores due to selected environmental parameters and to assess the extent of discomfort experienced by the cashiers of selected retail stores. The major areas of related literature, survey, scholarly articles, books and other sources relevant to particular issues, area of research, or theory, providing a description, summary and critical evolution of each work are presented here. In order to make the review clear and understanding, the present chapter is divided into the following section:

## 2.1 Theoretical Orientation

For the presentation the theoretical literature was divided into following five subheads namely;

**2.1.1.** Retail Stores: Introduction

**2.1.2.** Organisational Structure of retail stores

**2.1.3.** Roles and Responsibilities of Cashiers

**2.1.4.** Environmental Parameters at checkout counters

**2.1.5.** Physiological health problems experienced by the cashiers due to selected environmental parameters

**2.1.6** Psychological Health Problems experienced by the cashiers due to selected environmental parameters

**2.1.7** Musculoskeletal discomforts among cashiers

## 2.2. Related Researches

**2.2.1** Researches conducted outside India

**2.2.2** Researches conducted within India

## Conclusion

## 2.1 Theoretical Orientation

Theoretical Orientation is the section which describes about the theoretical content related to the topic of the study. These are discussed independently in the succeeding description.

### 2.1.1 Retail Stores: Introduction

In India, the retail sector is the second largest employer after agriculture. The retail industry in India is largely unorganized and predominantly consists of small, independent, owner-managed shops (Bajaj et.al. 2011). The retail sector in India is emerging as one of the largest sectors in the economy (Patil and Vishwakarma, 2010). Retailing is India's largest in terms of contribution to GDP and constitutes over 10 per cent of GDP and around 8 per cent of the workforce in the country. There are around 12 million retail outlets in India apart from an unaccounted number of low-cost kioks (tea, stalls, snack centers etc.) and pushcarts/mobile vendors. Traditional retail formats refer to those outlets that have long been part of the retail landscape of India. They include the kirana shops and independent stores that are typical of the unorganized retail sector across product categories, cooperatives and government controlled retail institutions (Bajaj et.al. 2011). Indian retail industry has matured over the years although it is still highly fragmented, with an estimated 12 to 15 million outlets.

Retail industry is expected to grow to rupees 130000 Crore by 2020 (Kumar and Rao, 2018). More and more new as well as established companies in other trades are joining the retail business in India, contribution to the introduction of new formats like malls, supermarkets, hypermarkets, discount stores, department stores, and even changing the traditional looks of bookstores, company-owned stores, chemist shops, and furnishing stores (Bajaj et.al. 2011). Retail stores in India have become modern, which is from the fact that there are multi-storied malls, huge shopping centers, and sprawling complexes which offer food, shopping, and entertainment all under the same roof (Kumar and Rao, 2018).

Retail Stores come in all shapes and sizes, from local hairstyling salon or family-owned restaurant to national specialty chain retailers. They can be classified in terms of several characteristics such as the amount of service they offer, the breadth and depth of their product line, the relative prices they charge and how they are organized (Kotler and Armstrong, 2016).

According to Kotler and Armstrong, (2016), today, consumer can shop for goods and services from a wide variety of stores. The important types of retail stores are as follows:

- **Specialty store:** A store that carries a narrow product line with a deep assortment, such as apparel stores, sporting-goods stores, furniture stores, florists and bookstores.
- **Department store**: A store that carries several product line typically clothing, home furnishings, and household goods with each line operated as a separate department managed by specialist buyers or merchandisers.
- **Super markets**: A relatively large, low cost, low margin, high volume, self service operation designed to serve the consumer's total needs for grocery and household products.

- **Convenience store**: A relatively small store located near residential areas, open long hours seven days a week, and carrying a limited line of high turnover convenience products at slightly higher prices.
- **Discount store:** A store that carries standard merchandise sold at lower prices with lower margins and higher volumes.
- **Off price retailer**: A store that sells merchandise bought at less than regular wholesale prices and sold at less than retail. These include factory outlets owned and operated by manufacturers; independent off-price retailers owned and run by entrepreneurs or by divisions of larger retail corporations; and warehouse (or wholesale) clubs selling a limited selection of goods at deep discounts to consumers who pay membership fees.
- **Superstore**: A very large store that meets consumers' total needs for routinely purchased food and nonfood items. This includes supercenters, combined supermarkets and discount stores.
- **Hyper Markets:** A hypermarket is a retail store that combines a department store and a grocery supermarket. Hypermarkets offer a wide variety of products such as appliances, clothing, and groceries.

Seetharaman and Sethi (2002), mentioned some more types of retail outlets which are discussed as follows:

- **Cooperatives:** A cooperative is a retail outlet owned and run by consumers for consumers. A group of consumers from a registered society which runs the store often known as a consumer cooperative.

- **State Emporia:** State Emporia offer the product ranges from each State varying from furnishings, household items, clothes to jewellery, crafts and decorative items. The products sold here are of high quality and reasonably priced.

- **Variety Store:** This offers a large assortment of reasonably priced goods ranging from stationery, gift items, toiletries, light household goods, confectionery and practically everything a person or family may need for everyday living.

- **Discount Store:** This is a variety store which has a low operating-cost ratio. The total expenses are about 10 per cent lower than those of departmental stores.

- **Door to door selling:** This is also called as 'mobile vending'. For manufactures or traders, this method is effective for sales promotion with low overhead costs.

- **Vending:** Coin operated machines are fixed at certain locations for the automatic supply of beverages, including milk, tea, coffee and cold drinks.

- **Selling by phone:** In this, one can order provisions on phone and get them delivered at home, free of charge.

- **Mail order/online selling:** This are the businesses which sell on basis of mail orders or online orders. Mail orders are generally prevalent in the area of readymade garments, books, well-known makes of cosmetics, sports and household goods. Similar to mail orders, goods can be ordered online to be delivered at home.

Indian Retail sector has seen tremendous growth within the organized section. Some of the retail companies in India are Reliance Retail, Tata Group, Raymond Group, Kurl-on, Aditya Birla Fashion & Retail Ltd, Kewal Kiran Clothing Ltd, Future Retail Ltd, Avenue Supermarkets Ltd, Godrej India Ltd, Future Lifestyle Fashions Ltd, K Raheja Corp Group, V2 Retail Ltd, Provogue (India) Ltd, V-Mart Retail Ltd and Cantabil Retail India Ltd.[1]

### 2.1.2 Organizational Structure of Retail Stores

The organizational structure lays down the activities to be performed by specific employees and demarcates the lines of authority and responsibility within the firm (Fig. 1). The structure of an organization is developed keeping in mind the organizational strategy and vision (Bajaj et al. 2011).

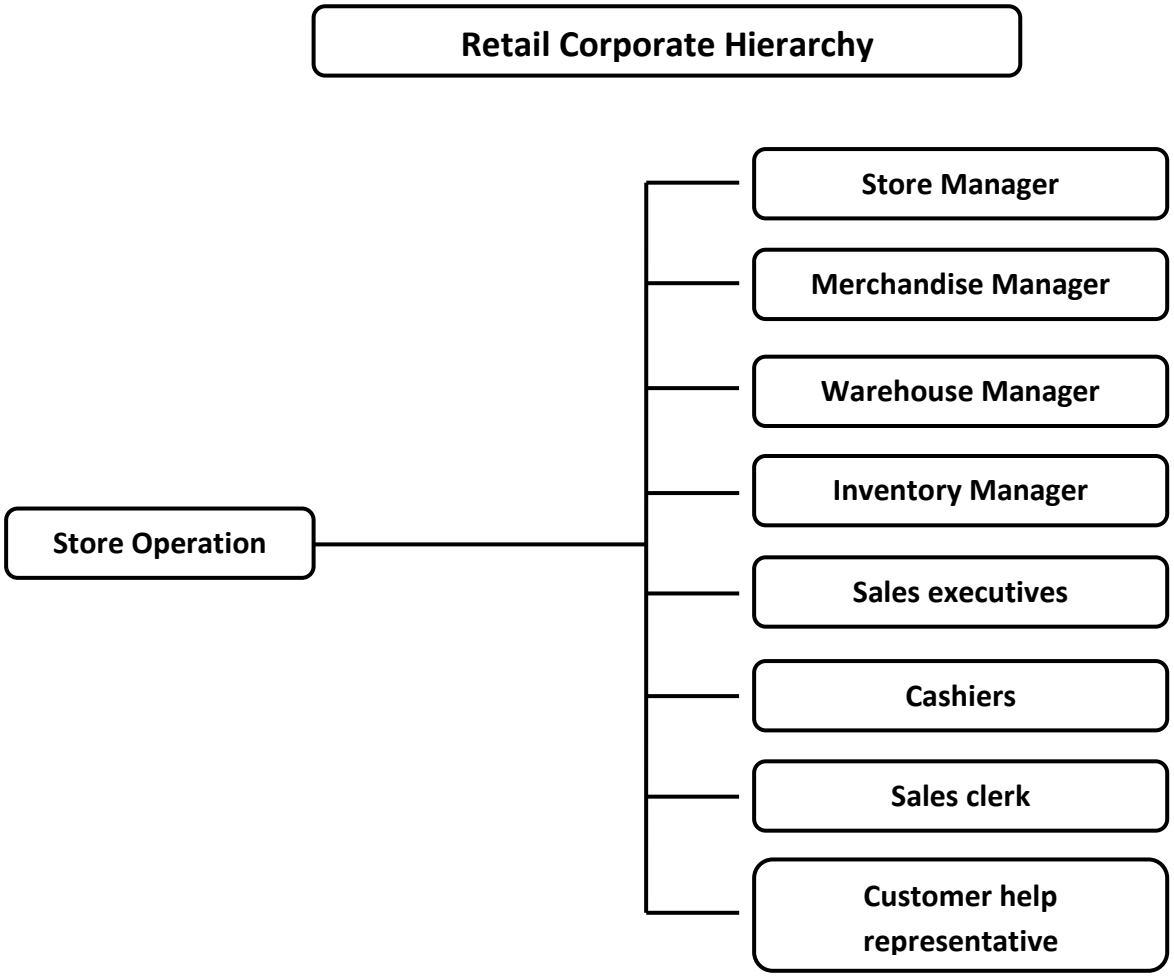



**Figure 1: Retail Corporate Hierarchy**

*(Source:https://www.hierarchystructurecom//wp-content/uploads/2014/12/retail-corporate-hierarchy.jpg.)*[2]

Store managers are on the front line of retailing. They manage the day to day operations and ensure smooth running of the retail store. Store managers are in daily contact with customers and are hence aware of customer requirements

(Bajaj et. al. 2011). A floor manager works under the store manager and like the salespeople the floor manager manages and serves customers by answering their questions and selling merchandise to them. A floor manager has operational responsibilities; s/he routinely takes inventory of the current stock and records products as necessary. In addition, s/he recruits and trains new salespeople and leads sales team meetings. The sales assistants provide courteous and knowledgeable customer service in every area of the store. They also ensures correct placement of merchandise throughout the day and assisted customers in making purchases. In retail store there are also housekeeping activities which include cleaning, dusting, sweeping and keeping the store clean, uncluttered and pleasant to shop and protect merchandise as much as possible from becoming soiled and eaten away by shop worms (Sheikh and Fatima, 2012). In small store, the owner who is also the salesperson does the housekeeping work himself. In large stores, dedicated staff is hired for housekeeping (Bajaj et al, 2011). Furthermore, the cashiers in retail stores facilitate money transactions for customers. Cashiers can pull a sales report at any time during a shift (Singh, 2015).

### 2.1.3 Roles and Responsibilities of Cashiers

A cashier is someone whose main focus is to facilitate money transactions for customers by accepting cash, cheques, credit or debit. Cashiers deal with a great transaction of money on a daily basis; therefore they need to be honest, trustworthy and reliable employees. A cashier's duties are dependent on their place of employment, but their primary responsibilities are to greet each customer in a positive manner, enter purchases into cash register to calculate total purchase price, assist customers in locating specific items, request information or assistance using a paging system, weigh items sold by weight in order to determine prices, identify price of merchandise by using electronic scanners, sell lottery tickets and other items to customers, redeem food stamps and coupons, accept payment by either cash, cheque, credit, debit or voucher, give correct change due to the customer, issue a receipt, bag, box, wrap, or gift wrap merchandise for the

customer, resolve customer complaints, rectify any price discrepancies, handle refunds, exchanges, credits or rain checks, count money in cash drawers at the beginning of the shift, count money at the end of the shift and note any discrepancies, calculate total payments received during the shift, and reconcile with total sales, keep register area neat and stocked with necessary supplies, assist in other areas of store; clean-up, shelf-stocking, keeping merchandise displayed in an orderly manner. A cashier's work schedule can be full or part-time, and may include evening, weekend and holiday work. They typically work indoors, and can work in a variety of places, such as supermarkets, grocery stores, retail/department stores, movie theatres, hotels, fast food places, restaurants, liquor stores, gas stations, casinos, recreational facilities. [3]

### 2.1.4 Environmental Parameters at the checkout counters of selected retail stores

The work environment is defined as the establishment and other locations where one or a group of employees are working or are present as a condition of their employment. Important factors in the work environment that should be considered include building design, workplace layout, workstation set-up, furniture and equipment design and quality, space, temperature, ventilation, lighting, noise, vibration, radiation and air quality (Sanjog, 2013). The environmental parameters considered for the present research were noise, illumination, temperature and humidity. These parameters are discussed as below:

**2.1.4.1 Noise:** Noise can also be defined as undesirable sound to which an individual is exposed. Differentiation between the desirable and undesirable sound depends upon various factors including time and duration, character of sound and worth of the information containing in that sound. **"**Noise is referred as the sound that disturb the normal level of human perception of sound" as stated by Gupta, 2006. Kroemer and Grandjean (1997) said, "Noise is any unwanted sound".

According to Bridger (1995),

> "Noise is usually defined as a sound or sounds at such amplitude as to cause annoyance or to interfere with communication. Sound can be measured objectively, but noise is a subjective phenomenon".

Most environmental sounds are made up of a complex mix of many different frequencies. Frequency refers to the number of vibrations per second in the air in which the sound is propagating. The units used to measure the frequency and intensity of sound is known as hertz (Hz) and decibel (dB) respectively (Kroemer and Grandjean, 1997). The audible frequency range is normally considered to be 20-20000 Hz for younger listeners with unimpaired hearing. However, the hearing systems are not equally sensitive to all sound frequencies and to compensate for this various types of filters or frequency weighting have been used to determine the relative strengths of frequency components making up a particular environmental noise.[5] In United States of America it has been regulated to limit noise exposure to 90 dBA for an 8 hour period while in Greece it is suggested that 80 dBA exposure dose is harmless while 85/90 dBA is termed as guide number (Eleftheriou, 2002). International Organization for Standardization (ISO) specifies the maximum acceptable noise dosage of 85-90 dBA with a maximum exposure time of 8 hours/day and 5 days/week (40hours/week) (Shaikh, 1999 and Habali et al. 2002,).

The three curve of sound rating, currently recommended, are set out in dB (A), dB (B) and dB (C). The weighted noise level in dB (A) is used most commonly. Numerous physiological studies have shown that the noise level measured in dB(A) is suitable for measuring the subjective distance arising from many sources of noise. Thus, dB(A) may be used with confidence to compare the noise of one vehicle with other where the spectra are almost identical (Sharma, 1984).

According to Kroemer and Grandjean (1997), the length of exposure and intensity of sound should not be more than the following:

| Hours | dB (A) |
|---|---|
| 8 | 90 |
| 6 | 92 |
| 3 | 97 |
| 1.5 | 102 |
| 0.5 | 110 |

*Source: Kroemer and Grandjean (1997). Fitting the task to the human (5th ed.). Tailor & Francis Publishers since 1978.*

Grandjean (1988) proposed as a limiting value for an 8- hour day not to exceed 85 dB(A) to avoid noise damage. The noise chart below gives the recommendation amount of noise levels acceptable for different structures from the viewpoints of economy, comfort and practical consideration prevailing in India (Rangwala, 2014).

| Types of building | Acceptable noise level in dB (A) |
|---|---|
| Radio and T.V studio | 25 to 30 |
| Auditoriums and music rooms | 35 to 40 |
| Small offices, court rooms, libraries | 40 to 45 |
| Hospitals | 40 to 50 |
| Schools | 45 to 50 |
| Residential buildings and restaurants | 45 to 55 |
| Large public offices, banks and retail stores | **50 to 60** |
| Factories and Industries | 60 to 65 |

*Source: Rangwala S.C (2014). Building construction (32nd ed.), Charotar publishing house pvt.ltd. Anand, Gujarat.*

Noise has a negative impact on the working efficiency, harms the hearing ability and annoys the people who are exposed to it.

**2.1.4.2 Illumination:** Illumination allows an individual to gather the information from its surrounding and determine the size, shape, colour and movement. Sufficient illumination makes it more easy for the workers to work and can prevent accidents (Butt, 2012). There are two kinds of illumination i.e natural illumination and artificial illumination. Natural illumination is a free resource that enters the room through window or skylight, whereas artificial illumination is the kind of light which is produced and designed by manufacturing (Sarode and Shirsath, 2014).

According to Bhatt (2009),

> "Light is a form of radiant energy that acts upon the retina of the eye optic nerve, brain, etc. making sight possible".

The amount of illumination falling on a surface is termed as illuminance and the unit for measurement is known as lux. Light meter/ lux meter is used for measuring illuminance. Illumination intensities in the range of 300 lux – 1000 lux are necessary for manual work (Hoppe, 1988). Acceptable level of illumination was above 300 lux as found out in a field study in offices when the illumination intensity in the survey ranged from 93 lux to 1424 lux (Huang et al., 2012). A study spanning 16 months reported significant increase in productivity levels of workers who were provided with controllable task lighting arrangement (Juslen et.al, 2005). Visual tasks in assembly and inspection tasks like rough work, medium work, fine work, very fine work require 200, 400, 900 and 2000 respectively (Belbin, 1970).

The chart below gives the recommended amount of illumination levels acceptable for different areas as given by Chauhan 2016.

| Activity | Illumination (lux) |
|---|---|
| Public areas with dark surroundings | 20 – 50 |
| Simple orientations for short visits | 50 – 100 |
| Working areas where visual tasks are only occasionally performed | 100 – 150 |
| Warehouses, homes, theaters, archives | 150 |
| Easy office work or classes | 250 |
| Normal office work, study library, groceries, show-rooms, laboratories | **500** |
| Supermarkets, mechanical works, office landscapes | 750 |
| Normal drawing work, detailed mechanical workshops | 1000 |
| Detailed drawing work, very detailed mechanical work | 1500 – 2000 |
| Performance of visual tasks of low contrast and very small sizes for prolonged periods of time | 2000 – 5000 |
| Performance of very prolonged and exacting visual tasks | 5000 – 10,000 |
| Performance of special visual tasks of extremely low contrast and small size | 10,000 – 20,000 |

*Source: Chauhan (2016). Ergonomics: Practical Manual for Beginners*

Illumination at work place also plays a very important role in improving the efficiency, safety and health of workers. It is said that workplace illumination is among the important parameters influencing worker's productivity in terms of speed, quality of work, downtime, absenteeism and accident rates (Hoffmann et al., 2008). Illumination sources, including the sun, can create unwanted reflections, glare and shadows in the workplace that can cause discomfort and distraction, and can interfere with the performance of visual tasks (Patil and Bhakkad, 2014). Poor illumination can be a safety hazard- misjudgment of the position, shape or speed of an object can lead to accidents and injury. It affects

the quality of work, specifically in situation where precision is required, and overall productivity.

**2.1.4.3 Temperature and Humidity:** Temperature is a physical quantity expressing hot and cold (Zimmermann, 2019). Temperature is a numerical representation of hot or cold compared against baselines, typically the point at which water freezes and boils. In meteorology, temperature measures the heat content of the atmosphere (Zimmermann, 2013). The higher the relative humidity, the higher the temperature actually feels. Among different indoor environmental conditions/factors thermal comfort is preferred/given greater importance compared to visual, acoustic and air quality (Hoppe, 1988). According to Belbin (1970), optimum air temperature recommended for persons doing light work is 18.3$^{o}$ C and comfort zone is between 15.6$^{o}$ C to 20$^{o}$ C. respective values for individuals engaged in sedentary office work and active factory jobs are 19.4$^{o}$ C to 22.8$^{o}$ C and 12.8$^{o}$ C to 15.6$^{o}$ C respectively. International Organization for Standardization (ISO) 9241 has mentioned 20$^{o}$ C – 24$^{o}$ C for winter and 23$^{o}$ C – 26$^{o}$ C for summer as acceptable indoor temperature range for workers (Bridger, 2002). According to Kroemer and Grandjean (1997), the air temperature in winter should be between 20$^{o}$ C and 21$^{o}$ C and in summer between 20$^{o}$ C and 24 $^{o}$ C.

The most prevalent measure for humidity of indoor ambient air is the relative humidity. Humidity has been investigated in a number of field surveys in hot climates, and was found to have a significant effect on comfort temperature (Nicol, 2004). Recommended range of relative humidity is between 30% and 70% for indoors. The relative humidity of the air in the room should not fall below 30 per cent in winter, otherwise there will be a danger of desiccation problems in the respiratory tract. In summer natural the relative humidity usually fluctuates between 40 per cent and 60 per cent and is considered comfortable (Kroemer and Grandjean, 1997).

### 2.1.5 Physiological Health problems experienced by the cashier due to selected environmental parameters

Goines (2007) has documented adverse physiological health effects of noise pollution on humans as stated by the World Health Organization (WHO) were **hearing impairment** and **Cardiovascular Disturbances**. Hearing impairment is typically defined as an increase in the threshold of hearing as clinically assessed by audiometer. Noise induced hearing impairment may be accompanied by abnormal loudness perception (loudness recruitment), distortion and tinnitus. **Tinnitus** may be temporary or may become permanent after prolonged exposure. A growing body of evidence confirms that noise pollution has both temporary and permanent effects on humans (and other mammals) by way of the endocrine and autonomic nervous systems. Acute exposure to noise activates nervous and hormonal responses, leading to temporary **increases in blood pressure, heart rate and vasoconstriction** (Belbin, 1970). Most occupational studies have suggested that individuals chronically exposed to continuous noise at levels of at least 85 dB have **higher blood pressure** than those not exposed to noise (Lang et.al, 1992).

Moreover, Improper illumination also cause **eye fatigue**, **headaches**, **dizziness** and **nausea** (Kuller,1986). Working in dim or over bright work environments can result in eyestrain, headaches and reduced productivity. Poor illumination can also cause health hazard, too much or too little light **strains eyes** and may cause **eye discomfort** and **headaches**.[4] Visual comfort is considered as one of the quality measures to be relevant for indoor functional illumination (Knoop, 2011). One aspect of visual comfort is discomfort glare, which is the type of glare that occurs when people complain about visual discomfort from bright light sources (Geerdinck et.al,2014). **Eye discomfort** is a general term which can include some or many symptoms. It may be part of “computer vision syndrome” which includes **eyestrain**, **dry eyes**, **blurred vision**, **red or pink eyes**, **burning of eyes**, **light sensitive**, **headaches** and **pain in the shoulders**, **neck and back**.[5]

Ceiling mounted neon lights often caused headache, eye strain and fatigue (Hoppe, 1988).

Extreme temperatures can cause various problems for workers. Hot temperatures can lead to **dehydration** and **muscle fatigue**, especially in conjunction with high humidity. Cold temperatures make the muscles less flexible, resulting in **muscle strain**. Problems may include: **trouble breathing**, **fatigue**, **reduced dexterity**, **sensory sensitivity**, and **reduced grip strength** (Seppanen et.al, 2006). Seppanen and Fisk (2005) analyzed various studies and reported that increasing room air temperature within 20.0-23.0$^{o}$C may improve work performance while any increase beyond this range may lead to negative productivity. Overheating can result in **heat cramps**, **fainting**, **heat exhaustion**, **heatstroke**. Low humidity tend to have negative effects on mucous membranes of upper respiratory tract leading to dryness which in turn cause them to lose their protective function against infections whereas higher relative humidity levels cause condensation, moistening at cool external walls and formation of mould (Hoppe, 1988). Low humidity can also have variety of effects on the human body such as **dry nasal** passages which cause **nose bleeding**, **scratchy throat**, **dry skin** which results **itching** and **flacky skin** and **chapped lips**. Apart from these, low humidity can even cause problems with eyes. As low humidity saps the body of moisture, it can increase the evaporation of tears. Low humidity can **disrupt the moisture balance** and cause **itching** or even **watery eyes**.[6]

### 2.1.6 Psychological Health problems experienced by the cashiers due to selected environmental parameters

The psychological health problems identified due to noise were interference with **sleep disturbances**, **disturbance in mental health**, **impaired tasks performance** and **negative social behavior** and **annoyance reaction**. Noise pollution interferes with the ability to comprehend normal speech and may lead to a number of personal disabilities, handicaps, and behavioral changes. These include problems like **concentration**, **fatigue**, **lack of self confidence**,

**irritation**, **misunderstandings**, **decreased mental working capacity**, **disturbed interpersonal relationships** and **stress reactions**. Noise pollution impairs task performance at school and at work, increases errors and **decreases motivation**. The term annoyance does not begin to cover the wide range of negative reactions associated with noise pollution. These include **anger**, **disappointment**, **dissatisfaction**, **withdrawal**, **helplessness**, **depression**, **anxiety**, **distraction**, **agitation or exhaustion** (Goines, 2007).

Several studies have shown that illumination too is a potential environmental feature impacting office workers mental well being, behavior and performance. More specially, these studies indicated that the colour of white lighting and the type of light source can affect employees' **feelings of alertness**, self-reported performance and their need for recovery during regular working hours (Mills et.al, 2007; Viola et.al, 2008; Smolders et.al, 2012;). The illumination and colour of the workplace itself also had an **influence on the mood** of persons working there (Kuller, 2006). Low levels of illumination can cause **depression**, which for some people may be severe.[4]

Moreover, studies have shown that workers perception of well-being and their motivation to work were also significantly affected by air-temperature. The workers **tension**, **fatigue** and **anger emotion** and **total mood disturbance** were significantly affected by air temperature (Lan et.al, 2010).

### 2.1.6 Musculoskeletal Discomforts among Cashiers

According to World Health Organization (2019),

> Musculoskeletal conditions comprise more than 150 diagnoses that affect the locomotor system – that is, muscles, bones, joints and associated tissues such as tendons and ligaments, as listed in the International Classification of Diseases. They range from those that arise suddenly and are short-lived, such as fractures, sprains and strains; to lifelong conditions associated with ongoing pain and disability.

Musculoskeletal discomforts are typically characterized by pain (often persistent pain) and limitations in mobility, dexterity and functional ability, reducing people's ability to work and participate in social roles with associated impacts on mental wellbeing, and at broader level impacts on the prosperity of communities. The most common and disabling musculoskeletal conditions are osteoarthritis, back and neck pain, fractures associated with bone fragility, injuries and systemic inflammatory conditions such as rheumatoid arthritis. World Health Organization (WHO) recognises that musculoskeletal health conditions contribute greatly to incapacity across the life-course in all regions of the world. Especially, World Health Organization (WHO) recognizes that musculoskeletal conditions significantly impact functional ability. [7] Musculoskeletal discomforts can be related to the work activities and conditions, and they could significantly contribute to the development of Musculoskeletal Disorders. According to World Health Organization (2019), discomforts that result in pain and functional impairment that affect the neck, shoulders, elbows, forearms, wrists, and hands as work related when the work activities and work conditions significantly contribute to the development of work-related disorders.

According to the National Institute for Occupational Safety and Health (2019), Musculoskeletal disorder (MSD) is a damage that affects the musculoskeletal system of the human body, especially at bones, spinal discs, tendons, joints, ligaments, cartilage, nerves, and blood vessels. Such injuries may result due to repetitive motions, forces, and vibrations on human bodies during executing certain job activities. Previous injuries, physical condition, heredity, pregnancy, lifestyle, and poor diet are the factors that contribute to the musculoskeletal symptoms. Work-related musculoskeletal symptoms can be observed at workplaces when there is a discrepancy between the physical capacity of the human body and the physical requirements of the task. Work-related musculoskeletal disorders (WRMSDs) are described as wide range of chronic and inflammatory conditions which affect the supporting blood vessels, peripheral nerves, joints, ligaments, tendons, and muscles. Such conditions may lead to

functional impairment and pain that are widely experienced at the upper extremities and also the neck (Korhan and Memon, 2019).

According to US Department of Labor (2000), cashiers have been appointed as one of top ten occupations in developing musculoskeletal disorders (Zuhaidi and Rahman, 2017). The largest component of a cashier's job, an average 45-50% of customer transaction time, is spent scanning or handling products (Lehman, 1998). Cashiers handling the laser scanner may be at risk from developing upper limb disorders (Grant and Habes 1995). Their work usually involves upper limb disorders as cashiers tend to be on their feet while handling customer purchases (Clarke 2003).

Researchers suggest that the certain occupational risks contribute to Musculoskeletal disorders viz. shoulder load, static tension of the neck, shoulder and arm muscles, highly repetitive contractions in the shoulder muscles, work at or above shoulder level, repetitive grasping, extreme deviations of the wrists, and repetitive lifting of loads (Bjelle et al. 1978,1981, Luopajarvi et al. 1979, Hagberg and Wegman 1987). Other researchers who have studied aspects of checkout work recommend general ergonomics principles such as reducing the reach distance, minimizing lifting, reducing the work surface thickness, and using footrests and adjustable chairs (Wells et al. 1990, Orgel et al.1991, Strausser et al. 1991, Wilson and Grey 1994). Generally, the literature discourages a static work posture (either standing or sitting) and states that changes in work posture are important in reducing fatigue (Kroemer and Robinette 1969, Magora, 1972). That risk would most likely be increased for full time employees or those who work comparable hours per week.

## 2.2 Related Researches

### 2.2.1 Researches conducted outside India

An experimental study was conducted by **Lehman et.al (2010)** on “Effect of sitting versus standing and scanner type on cashiers”. This study was conducted to understand the effects of working position (sitting versus standing) and scanner type (bi-optic versus single window) on muscle activity, upper limb and spinal posture, and subjective preference of cashiers. Ten cashiers from Dutch retailer participated in the study. The findings of the study revealed that cashiers exhibited lower muscle activity in the neck and shoulders when standing and using a bi-optic scanner. Shoulder abduction was also less for standing conditions. In addition, all cashiers preferred using the bi- optic scanner with mixed preferences for sitting (n=6) and standing (n=4).

A study was conducted by **Kihlstedt and Hagg (2011**) on “Checkout cashier work and counter design- Video movement analysis, musculoskeletal disorders and customer interaction” in Sweden in order to analyze checkout cashiers’ movements at a checkout counter during interaction with customers and the prevalence of work-related stress and musculoskeletal disorders in checkout cashiers. The research was conducted among 50 cashiers from 7 shops. Cashier activities and movements, customer interaction and counter design issues were analyzed from the video data. Prevalence of work – related stress and musculoskeletal disorders was obtained from the questionnaire. The findings of the study showed that the prevalence of Musculoskeletal Disorders among the cashiers was quite high despite their low average age and the large number of male cashiers. The highest prevalence of MSD was in the neck (68%), shoulders (66%), lower (58%) and upper back (50%). The results showed that many cashiers experienced stress. The behavior of the customers was the major cause of stress. Other sources of stress arose from bad design or function of the computer system or other technical equipment.

**Maligaya et al. (2011)** conducted a study on “Ergonomic assessment of the working conditions of checkout counter cashiers in a Grocery store” in Phillippines. This study aimed to investigate the working conditions of the cashiers in one of the grocery store in the country. The focused grocery store has five cashiers who were female with age ranging from 21 to 33 years old. The perceived pain of each worker was determined using Cornell Musculoskeletal Discomfort Questionnaire (CMDQ). Rapid Entire Body Assessment (REBA) was conducted to evaluate their postures and identify the level of risk of developing musculoskeletal disorders (MSD). The results of the CMDQ showed that the neck, thighs, and feet are the body regions that ranked the highest in terms of prevalence of musculoskeletal discomfort (five out of five workers). These were followed by the shoulders, upper and lower back, upper arms, lower legs and hips/buttocks with four workers out five experiencing discomfort. Three workers experienced discomfort in the knees and two in the wrists and forearms. The tasks barcode scanning, reaching and bagging produce higher REBA scores compared to the other tasks such as getting a bag and operating the cash register. This puts them more at risk due to the longer duration of time spent doing the tasks.

A study was conducted by **Ruslan (2014)** on “Effects of air temperature, humidity and lighting on workers’ comfort and health in call centre department” in Malaysia. This study determines the effects of air temperature, humidity and lighting between genders and ages among workers. About 30 measurements were taken at different locations during 9.00 a.m, 12.00 p.m and 5.00 p.m. A survey was conducted among 40 respondents to identify the exposure and symptoms or other health related problems among the workers. The results of the study indicated that the mean value recorded for temperature at 9.00 a.m was 25.4$^{o}$ C, for temperature at 12.00 p.m was 23.8$^{o}$ C and mean for temperature at 5.00 p.m was 23.4$^{o}$ C. While for Humidity, the mean value for humidity at 9.00 a.m is 58.98 (RH%), at 12.00 p.m is 57.84 (RH%) and the last reading which was for humidity at 5 p.m is 60.20 (RH%). The mean value for lighting is 278.9 lux during 9.00 a.m and 282.7 lux for the mean at 12.00 p.m and

mean results during 5.00 p.m shows 280.4 lux. The findings also indicated that there was no significant difference between gender and ages towards the effect of the temperature, humidity and lighting on the workers' health.

**Capodaglio (2017)** conducted a study on "Occupational risk and prolonged standing work in apparel sales assistants". The aim of this study was to assess the postural risk of sales assistants working in a prolonged standing posture, focusing on critical issues for the lower limbs. The study was conducted in 70 sales assistants employed among 9 apparel stores in northern Italy. An observational approach was adopted together with the application of standard ergonomic tools (RULA, REBA, Strain Index, OCRA) to assess the postural risk. The findings of the study indicated that the work of sales assistants in the apparel retail sector was characterized by the prolonged standing posture which accounted for more than 80% of the work shift duration, alternation with walking phases occur according to assigned tasks and work organization. The musculoskeletal discomfort of the lower limbs reaches a medium- high intensity in 75% of the workers at the end of the work shift.

**Comentale et al. (2018)** conducted a study on "Comfort and ergonomics evaluation of a checkout workstation" in Italy. This study analyzed how cashiers were moving in their workspace, with their own tools and devices and does their jobs. Photo and video acquisition were done to acquire postures and movements by DARTFISH software and DELMIA software was used to model humans postures, workstation and interactions. The results were processed by CaMAN software. The results of the study showed a good correlation among subjective evaluations and calculated comfort indexes. In particular, high correlations have been found for neck, shoulders and hand.

A study was conducted by **Musa et.al (2018)** on "Impact of Indoor air temperature in thermal comfort of tertiary institutions' classroom" in Nigeria. A total of twenty classrooms were assessed for meteorological indoor conditions: air temperature ($T_a$), relative humidity (RH), air velocity ($V_a$). Three thousand five

hundred questionnaires were administered to students to determine their thermal condition during lectures. The results showed that 22.6% and 15.1% of the students felt warm and slightly warm with 13.5% and 10.1% experiencing hotness and very hot conditions. Some students (11.5% and 7.6%) felt slightly cool and cool with 1.75% of the students experiencing neutrality with the indoor meteorological conditions. The study established that the human responses to the thermal environment are inherently difficult to predict due to subjective assessment of indoor users. These have a considerable effect on comfort and health of the students during lecture.

**Deng et.al (2019)** conducted a study on "Musculoskeletal disorders, psychological distress and work error of supermarket cashiers". The aim of this study was to analyze the relationships among the musculoskeletal disorders (MSDs), psychological distress, and work error of supermarket cashiers. There were 443 Chinese supermarket cashiers surveyed in this study. The study surveyed the musculoskeletal disorders (MSDs), psychological distress of supermarket cashiers with musculoskeletal disorders (MSDs) Likert scale and Symptom Checklist-90 (SCL-90) scale, respectively. The findings of the present study revealed that the increasing working years of Chinese supermarket cashiers were connected with increased musculoskeletal disorders (MSDs). Significant differences were observed in musculoskeletal disorders (MSDs) and work error of cashiers from different supermarkets. The results of the data analysis show that for Chinese supermarket cashiers, the extent of musculoskeletal disorders of hands (wrists) is higher than that of shoulders and neck. Good checkout counter design with flat conveyor is helpful to reduce cashiers' MSDs and work error. The physiological health and psychological distress of supermarket cashiers are important to work performance and require serious attention.

### 2.2.2 Researches conducted within India

A descriptive study was conducted by **Parikh (2011)** on “Noise level and its effects on residents of selected areas of Vadodara city”. The objectives of the study was to study the level of noise and its adverse effects on the homemakers and find out the measures taken to reduce the noise entering in the house. The study was conducted in two areas of Vadodara city viz. Iscon Temple and Mahatma Gandhi Road. Interview schedule and record sheet were used as an instrument to gather the information from the 60 households. The findings of the study revealed that amongst various sources of external noise the noise from traffic and transportation was experienced the highest by all the respondents. The measures like suspended or recessed ceiling by the use of POP, thick upholstered furniture, thick curtains, floor carpets, ear plugs and cotton balls were used by the respondents. The total effects of noise entering in the house was found to be poor for less than two third of the respondents.

A study conducted by **Makwana (2012)** on “Ergonomic Assessment of Farming activities performed by women farm workers during harvesting of kharif paddy crop in Vadodara Takula”. The aim of the study was to analyze the various postures adopted by the respondents and to identify the main postures during the subtasks of paddy harvesting, to analyze the extent of body discomforts experienced while performing the subtasks and to analyze the number and duration of rest pauses taken by the respondents. The study also aimed to suggest remedial measures to overcome body discomfort of the respondents through pictorial devices. Three villages (Kapuria, Kelanpur, Dahboi) were selected from Vadodara Taluka for the present study. The total sample size consisted of 35 women farm workers engaged in harvesting of kharif paddy crop who had been working for at least two seasons. The data revealed that while performing the harvesting task majority of the women farm workers experienced discomfort in palm, wrist and lower back. Women were also adopting squatting, standing and bending posture for the first subtask squatting and moving posture in second subtask. While performing subtask first they were using tools (sickle)

for harvesting of paddy crop. According to the results the respondents were experiencing more pain in palm and wrist while using the tools where tool 1 was more uncomfortable for majority of the respondents.

A study conducted by **Laishram (2016)** on “Quality of life of Women Workers in Small Scale Handloom Industries” in Imphal city. The aim of the study was to assess the quality of life of women workers and to assess the indoor environment namely illumination, noise and working facilities at the workplace. The information was gathered from 82 women workers from four selected small scale handloom industries. An observation sheet and a record sheet was prepared along with interview schedule. The findings of the study revealed that the facilities provided and equipment available to the workplace was found not sufficient enough to add comfort to the entire respondents. Health related issues like frequent back pain, neck pain, visual fatigue, headache etc had found experiencing in majority of the respondents. Through observation and recording, the physical aspect of the work environment it was found to be depressive and the illumination level provided at each workplace was low as per the recommended illumination level.

A study conducted by **Adlakha (2018)** on “Ergonomic Design Assessment of Grocery Retail Stores in the malls of Delhi”. This study focuses on the store layout, environmental features of two grocery retail stores in malls of Delhi. The sampling method used was survey method including tools questionnaire and observation checklist. Digital lux meter and digital noise meter was used to measure the light and sound intensity respectively. The study was undertaken among 177 respondents where 89 samples were selected with 59 consumers (30 males and 29 females) and 30 staff workers (15 males and 15 females). The findings revealed that the design aspects and environmental features of the retail stores and the consumer satisfaction level regarding these aspects of the stores. The musculoskeletal problem among staff workers while working in store showed discomfort in back, shoulder, neck, knees and feet.

## Conclusion

The review of literature collected focused on introduction of retail stores, organizational structure of the retail stores, role and responsibilities of cashiers, environmental parameters at checkout counters viz. noise, illumination, temperature and humidity, physiological and psychological health problems experienced by the cashiers due to the selected environmental parameters and musculoskeletal discomforts experienced by the cashiers. The related researches conducted outside India focused on effect of humidity on workers, musculoskeletal problems of supermarket workers, effect of sitting versus standing and scanner type on cashiers, checkout cashier work and counter design, ergonomic assessment of checkout counter cashiers in grocery stores, effects of air temperature, humidity and lighting on workers' comfort and health, occupational risk and prolonged standing work in apparel sales assistants, comfort and ergonomics evaluation of a checkout workstation, impact of Indoor air temperature in thermal comfort of tertiary institutions.

The studies related to the research topic conducted within India focused on occupational health problems among women farm workers, ergonomic design assessment of grocery retail stores, quality of life of women workers in small scale handloom industries, ergonomic assessment of farming activities performed by women farm workers, noise level and its effects on residents of selected areas, occupational health hazards faced by health care workers, ergonomic assessment and modification of technologies used by women farm workers, ergonomic assessment of workload in critical activities of women farmers, work posture analysis and musculoskeletal problems experienced by the students of Architecture profession and occupational health problems experienced by the women workers of handloom industries. Hence, dearth of researches were found focusing on assessing environmental parameters at checkout counters of selected retail stores, extent of physiological and psychological health problems experienced by the cashiers due to selected environmental parameters and discomfort experienced by the cashiers of retail

stores. Therefore, the researcher was interested in carrying out an investigation on the topic undertaken.

# *Methodology*

# CHAPTER-III

# METHODOLOGY

Research methodology is a way to systematically solve the research problem or it may be understood as a science of studying how research is done scientifically (Kothari and Garg, 2019). The research design, variables under study, sample size and sampling procedure, tool for data collection and operational definitions of the terms used in the study are explained briefly in this chapter. The present investigation was undertaken to assess the selected environmental parameters at checkout counters, to gather information regarding the extent of physiological and psychological health problems experienced by cashiers due to selected environmental parameters viz. noise, light, temperature and humidity at checkout counters of selected retail stores and to assess the discomforts experienced by the cashiers. In order to achieve the aims of the present study, a detailed plan of work and sequential procedure was followed which is presented in this chapter under the following sub-headings:

**3.1** Research Design

**3.2** Variables and Conceptual frame work under study

**3.3** Operational Definitions

**3.4** Locale of Study

**3.5** Unit of Inquiry

**3.6** Sampling Size and Sampling Procedure

**3.7** Selection, Development and Description of the tools

**3.8** Data Collection

**3.9** Data Analysis

## 3.1 Research Design

According to Kothari and Garg (2019), a research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure and is the conceptual structure within which research is conducted. It consists of specification of methods for inquiring the information needed. The research design for the present investigation was descriptive in nature. According to Kothari and Garg (2019), “Descriptive research studies are those studies which are concerned with describing the characteristics of a particular individual, or of a group”. Descriptive design was thought to be most appropriate method to carry out the present research because it gathered the data on demographic details of the respondents, assessing environmental parameter at checkout counters of selected retail stores, extent of physiological and psychological health problems experienced by cashiers due to selected environmental parameters at checkout counters viz. noise, light, temperature and humidity and also to assess the discomforts experienced by the cashiers of selected retail stores.

## 3.2 Variables and Conceptual frame work under study

A concept which can take on different quantitative values is called a variable (Kothari and Garg, 2019). There were two sets of variables for the present study viz. independent and dependent variables (Fig. 2).

**3.2.1 Independent Variables of the respondents:** The variable that is antecedent to the dependent variable it is termed as an independent variable (Kothari and Garg, 2019).

For the present study the independent variables were categorized under two sub-heads:

- **Personal Variables of the respondents:** Personal Variables of the respondents included Age (in years), Gender, Years of service as cashiers.

- **Situational Variables of the respondents:** Situational Variables include environmental factors such as noise and illumination at checkout counters of selected retail stores.

**3.2.2 Dependent Variables of the respondents:** A variable that depends upon or is a consequence of the other variable is termed as dependent variable (Kothari and Garg, 2019). For the present study dependent variables were:

- Extent of health problems experienced by the cashiers selected Environmental parameters viz. noise and illumination at checkout counters.
- Discomfort Experienced by the cashiers during last 12 months.
- Discomfort that prevented the cashiers from carrying out their normal activities during last 12 months.

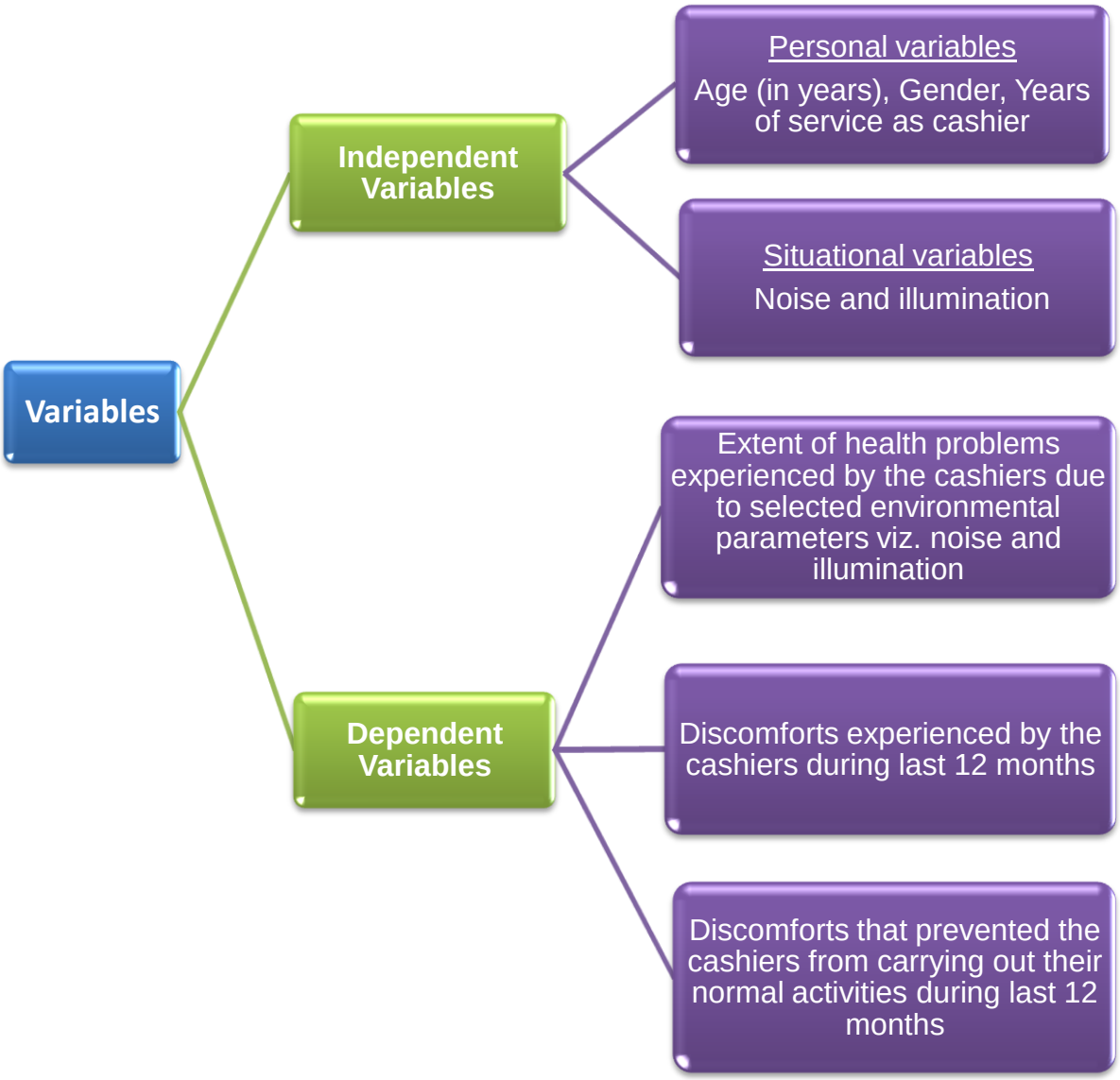



**Figure 2: Variables under study**

**Hypothetical Relationship between Variables:** A schematic diagram showing hypothetical relationship between selected variables with its explanation is presented below.

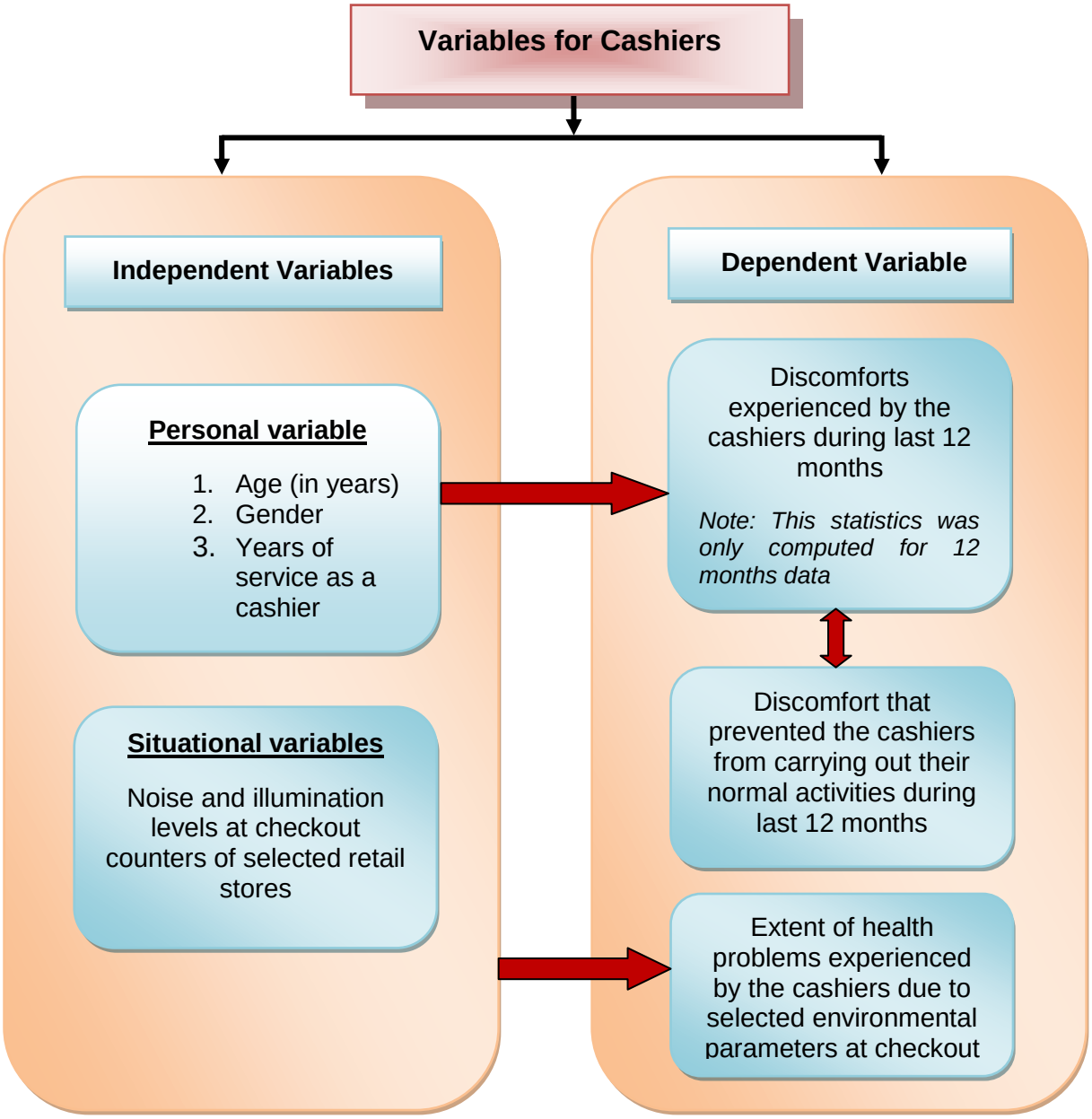



**Figure 3: Schematic Framework to show Hypothetical Relationship among Variables under study**

**Explanation of Conceptual Framework**

It was conceptualized that discomforts experienced by the cashiers during last 12 months were influenced by their personal variables such as age (in years), gender and years of service as cashiers. It was also theorized that the discomfort experienced by the cashiers during last 12 months had prevented the cashiers from carrying out their normal activities during last 12 months. It was further conceptualized that the extent of health problems of cashiers due to selected environmental parameters at checkout counters were influenced their personal variables such as age (in years), gender, years of service as a cashier and the situational variable such as noise and illumination at checkout counters of selected retail stores (Fig 3).

### 3.3 Operational Definitions

According to Ahuja (2011), “Operational definition of a concept or a variable assigns measuring to a construct by specifying the activities necessary to measure the construct or variable”. The operational definitions thus considered under study are discussed as below:

**3.3.1 Ergonomic Assessment:** It was operationally defined as assessment of discomforts experienced by cashiers, environmental parameters at checkout counters of selected retail stores and health problems experienced by the cashiers due to selected environmental parameters viz. noise, illumination, temperature and humidity.

**3.3.2 Cashiers:** It was operationally defined as a person who handles payments and receipt, scan barcodes, bagged products purchased by the customers in retail stores.

**3.3.3 Checkout counters:** It was operationally defined as a place in retail stores where the products purchased by the customers are scanned, payments are made and bagging of the products purchased is done.

**3.3.4 Discomfort experienced by the cashiers:** For the present study, it was operationally defined as the discomforts experienced by cashiers such as pain in neck, shoulder, upper back, upper arm, lower back, forearm, wrist, hip, thigh, knee lower leg and foot during last 7 days and last 12 months and discomforts that prevented them in carrying out normal activities during last 12 months. This was assessed through pre-validated Nordic Questionnaire.

**3.3.5 Extent of health problems experienced by the cashiers due to selected Environmental Parameters:** For the present study, it was operationally defined as the extent to which the cashiers experienced physiological and psychological health problems experienced by the cashiers due to selected environmental parameters at checkout counters viz. noise, illumination, temperature and humidity. This was assessed through a summated rating scale where the respondents were asked to state the extent of health problems experienced by them due to selected environmental parameters. The responses were “To high extent”, “To some extent”, “To low extent” which were scored 3 through 1 respectively. High score reflected high extent of health problems experienced by the cashiers.

**3.3.6 Environmental parameters:** For the present study, it was operationally defined as the environmental factors of the checkout counters of selected retail stores such as noise, illumination, temperature and humidity. This was assessed through noise meter (model: SL4001), lux meter (model: L-753831) and thermo-hygro meter (model: 412ATH) and readings were recorded in the record sheet during three shifts in a day viz. morning, afternoon and evening.

## 3.4 Locale of Study

The locale of the study was Vadodara city. Vadodara is strategically located with great accessibility to Mumbai and Delhi via both the railway

line and national highway and hence has been known as the Gateway to the Golden Quadrilateral.[8] It is the cultural capital of Gujarat, which is the third largest city in Western Indian state of Gujarat, after Ahmedabad and Surat. Vadodara is one of the important city in terms of trade in Gujarat. There are many retail stores in Vadodara city. Thus, shopping in Vadodara attracts a huge number of tourists to plan a visit to the city.[9] The sample for the present study was collected from nine different retail stores of Vadodara city.

### 3.5 Unit of Inquiry

The unit of inquiry was the cashiers of the selected retail stores of Vadodara city.

### 3.6 Sampling Size and Sampling Procedure

Various sampling technique were used to select sample for the present study (Fig. 4).

**For selection of Retail stores**

**Convenience Sampling Technique:** According to Kothari and Garg (2019), when population elements are selected for inclusion in the sample based on the ease of access, it is called convenience sampling. The permission was sought for collecting data from retail stores. For this the managers of retail stores were contacted, where permission was granted from 9 retail stores of Vadodara city. Hence, convenience sampling technique was used for selection of retail stores (Fig. 4).

**For selection of respondents**

**Purposive Sampling Technique:** According to Kothari and Garg (2019), Purposive sampling technique is a method of collecting samples involves selection of particular units of the universe for constituting a sample which represents the whole universe. The data were collected from 61 respondents who were working as a cashier for minimum 12 months in the selected retail

stores of Vadodara city. Therefore, purposive sampling technique was used for the selection of respondents from the retail stores (Fig. 4).

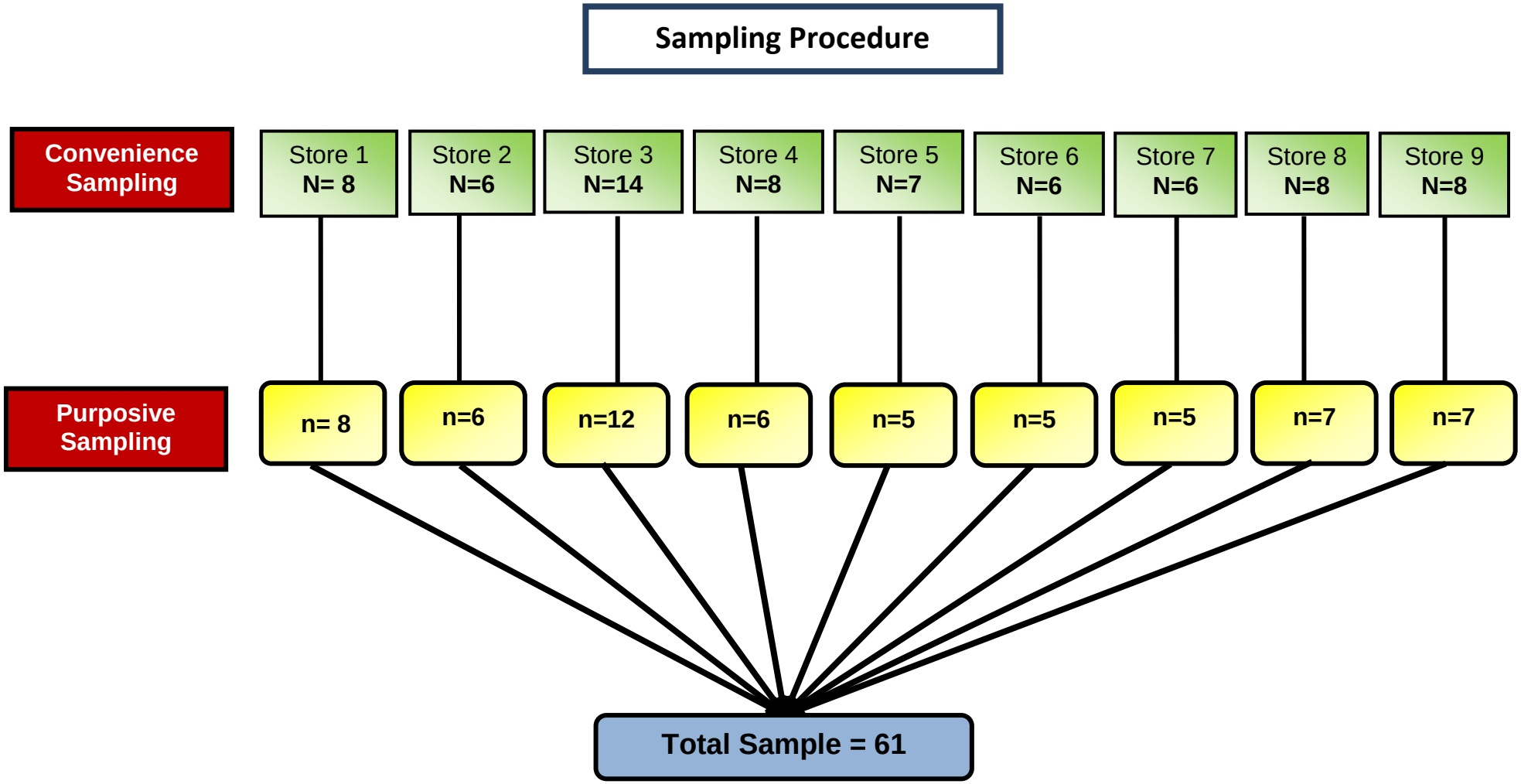



**Figure 4: Sampling size and Sampling Procedure**

### 3.7.1 Selection of the tool

In the light of objectives framed for the present study, two data collection tools were developed namely interview schedule and record sheet. Interview schedule was developed to find out the extent of health problems faced by the cashiers due to selected environmental parameters and extent of discomfort experienced by the cashiers. Record sheet was developed to record the readings of the environmental parameters such as noise, illumination, temperature and humidity during three shifts viz. morning (9:30am-10:30am), afternoon (1:30am-2:30am) and evening (5:30am-6:30am).

**Part I: Interview schedule (For Cashiers)**

Interview schedule had been thought to be the best suited tool for collection of data since it involves presentation of oral-verbal stimuli and reply in terms of oral-verbal responses (Kothari and Garg, 2019). The interview schedule has following advantages:

1. More information in greater depth can be obtained.
2. Samples can be controlled more effectively as there arises no difficulty of the missing returns; non-response generally remains very low.
3. The interviewer can collect supplementary information about the respondent's personal characteristics and environment which is often of great value in interpreting results.

**Part II: Record sheet (To measure noise, illumination, temperature and humidity)**

Record sheet is a sheet used by field researchers to systematically record observation (Ahuja, 2011). The record sheet has following advantages:

1. Superior in data collection on non-verbal behavior.
2. It is less complicated and less time- consuming
3. It approaches reality in its natural structure and studies events as they evolve.

The readings of environmental factors of retail stores viz. illumination level, noise level, temperature and humidity level obtained through light meter, noise meter and thermo-hygro meter respectively and were recorded in the record sheet during three shifts viz. morning (9:30am-10:30am), afternoon (1:30am-2:30am) and evening (5:30am-6:30am).

### 3.7.2 Development of the tool

Based on the information collected through review of related literature, interaction with experts in the field, guidance of the experts and personal observation, interview and record sheet were prepared. A care was taken to include all questions that would elicit the information needed to attain the objectives to the study.

### 3.7.3 Description of the tool

The various sections of the tools (Fig 5) developed for the study is described in detail as follow:

**3.7.3.1 Interview schedule for the cashiers:** The interview schedule comprised of three sections which are described as below:

**Section 1 Background information:** This section contained questions regarding the personal information of the respondents covering details on their age (in years), Gender, height (in cm), weight (in kg), marital status, years of service as cashiers, number of days at work in a week, total working hours per day, number of break in a day, duration of each breaks in a day.

**Section 2 Extent of health problems experienced by the cashiers due to selected Environmental Parameters at checkout counters:** It comprised of a summated rating scale of Likert type showing health problems experienced by the cashiers due to selected environmental parameters. It included list of physiological and psychological health problems experienced by the cashiers due to selected environmental parameters at checkout counters viz. noise, illumination, temperature and humidity. It had 3 point continuum for the

responses “to high extent”, “to some extent” and “to low extent” which were scored 3 through 1 respectively. High scores reflected high extent of health problems.

**Section 3 Discomfort experienced by the cashiers:** In this section, a standardized questionnaire namely “Nordic Questionnaire” was used to study the discomforts experienced by the cashiers while performing their tasks during last 12 months, last 7 days in different body parts viz. neck, shoulder, upper back, upper arm, lower back, forearm, wrist, hip, thigh, knee, ankles and feet. It also focused on finding out the discomforts that prevented the cashiers in carrying out daily activities during last 12 months in different body parts viz. neck, shoulder, upper back, upper arm, lower back, forearm, wrist, hip, thigh, knee, ankles and feet. The Nordic Questionnaire was developed from a project funded by the Nordic Council of Ministers. It was first published in 1987 by Kourinka et.al, 1987 in “Standardized Nordic Questionnaires for the analysis of musculoskeletal symptoms”.

**3.7.3.2 Record sheet:** The record sheet contained data regarding the noise level, illumination level, temperature and humidity level at the checkout counters of retail stores. It had columns to record the level of noise, illumination, temperature and humidity which were measured through sound level meter, lux meter and thermo hygro meter. The levels of noise, illumination, temperature and humidity were recorded for three different shifts viz. morning (9:30-10:30am), afternoon (1:30-2:30pm) and evening (5:30-6:30pm). The specifications of noise meter, lux meter and thermo-hygro meter was given as follows:

- **Digital sound meter specification (Plate 1)**

  **Model:** SL4001

  **Function:** dB (A and C frequency weighting), time weighting, Max. hold, AC and DC output

  **Display:** liquid Crystal display, 3.5 digits

**Measurements:** 3 ranges, 35 dB to 130 dB

**Accuracy:** 23 ± 5$^{o}$ C, Calibrating input signal on 94 dB (31.5 Hz to 8kHz).

**Frequency:** 31.5 Hz to 8,000 Hz

**Microphone:** electric condenser microphone, ½ inch standard size

**Range selector:** 30 to 80 dB, 50 to 100 dB, 80 to 130 dB, 50 on each step, with over and under range indicating

**Operating temperature:** 0$^{o}$ C to 50$^{o}$ C (32$^{o}$ F to 122$^{o}$ F)

- **Lux meter specification (Plate 2)**

  **Name:** Digital Battery Operated Lux meter

  **Range:** 0 – 50000 Lux

  **Sr. No:** L-753831

- **Thermo Hygro meter specification (Plate 3)**

  **Model:** 412ATH

  **Name:** Indoor Outdoor Thermometer with Hygrometer

  **In-Range:** 0$^{o}$ C~50$^{o}$ C (32$^{o}$ F~122$^{o}$ F)

  **Out- Range:** -40$^{o}$ C~70$^{o}$ C (-40$^{o}$ F~158$^{o}$ F)

  $^{o}$C ← → $^{o}$F exchangeable

  **Accuracy:** ± 1$^{o}$C RH ± 5%

  **Indoor-hygro range:** 25%RH to 90%RH

  **Features:** 1.5 meter sensor wire

  One 1.5 Volt AA battery


**Plate 1: Digital Sound Meter**


**Plate 2: Digital Lux Meter**


**Plate 3: Digital Thermo Hygro Meter**

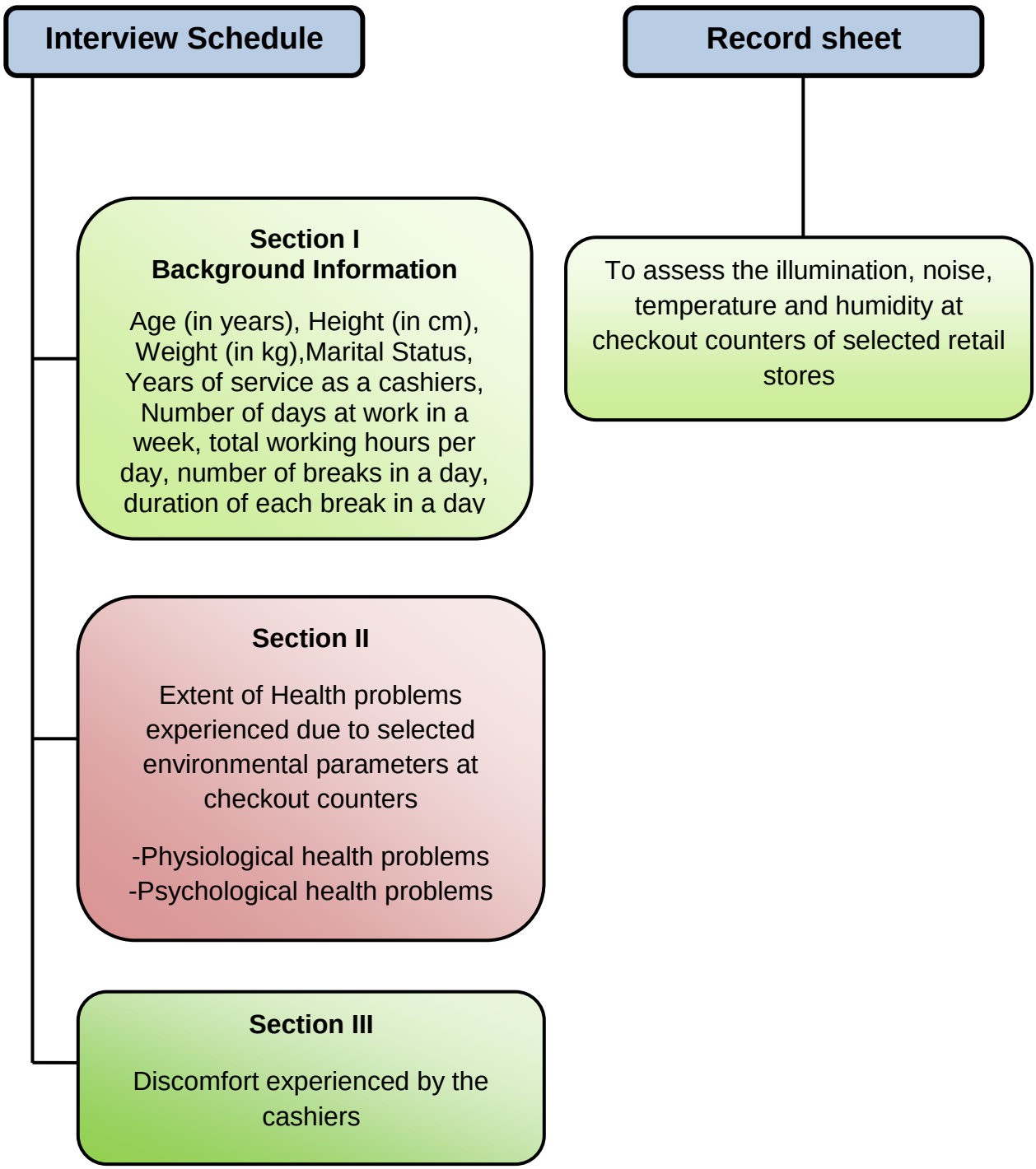



**Figure 5: Description of tool**

### 3.7.4 Establishment of Content Validity of scales

Validity indicates the degree to which a tool measures what it is supposed to measure (Kothari, 2012). The scale namely extent of health problems experienced by the cashiers due to selected environmental parameters, prepared by the researcher for the present study was given to the panel of three judges from Department of Family and Community Resource Management, Faculty of Family and Community Science, The Maharaja Sayajirao University of Baroda, Vadodara and two experts from Shreemati Nathibai Damodar Thackersey Women's University, Mumbai. They were requested to check the clarity and relevance of the content for the scale. They were also requested to state whether each item fell in the category under which it was listed. A consensus of 80% among the judges was taken as a yardstick for inclusion of the statement in the final tool. Therefore no changes had done in the final tool.

**Establishment of Reliability**

The reliability was established for the scale extent of health problems experienced by the cashiers due to selected environmental parameters through pretesting.

**Pretesting:** A pilot study was conducted to find out the feasibility and clarity of the scale developed. Therefore, the developed scale was pretested on 30 respondents who had similar characteristics as of those of final respondents of the study.

**Reliability of the scale:** Reliability is the degree of consistency that the instrument or procedure demonstrates; whatever it is measuring, it does so consistently (Best and Kahn, 2008). The reliability of the scale was established through split-half methods of establishing reliability. The Cronbach's alpha test has been applied on random 30 samples. The formula of Cronbach's alpha is as below:

$$\alpha = \frac{K\bar{r}}{(1 + (K-1)\bar{r})}$$

Where, $K$ is the number of components, $\bar{r}$ the mean of the $K(K-1)/2$ non-redundant correlation coefficients. The reliability was found for the scale extent of health problems experienced by the cashiers due to selected environmental parameters. The reliability value found was **0.906** for the scale which reflects the high reliability of the tool.

### 3.8 Data Collection

The data were gathered by the researcher between October 2019 to December 2019. The interview schedule and record sheet were used for data collection. Sound meter, Lux meter and thermo hygro meter were used to record data in the record sheet. The purpose of the research was explained and rapport was built so as to get the true responses. The investigator personally interviewed the respondents. The data were recorded in the record sheet by the researcher. First the readings of noise level, illumination level, temperature and humidity levels were recorded at the checkout counter at spot 1, after 5 minutes the readings were recorded on the spot 2 and after 5 minutes the readings were noted on spot 3. This process was repeated 3 times in a day i.e. in the morning from 9:30-10:30am, afternoon from 1:30-2:30pm and in the evening from 5:30-6:30pm at checkout counters of selected retail stores.

### 3.9 Data Analysis

The procedure used to analyse the data were categorization, coding, tabulation and statistical analysis.

#### 3.9.1 Categorization

The following categories were made to enable researcher to analyse the data for further statistical application.

i. **Age of respondents (in years):** It referred to the age of the respondents at the time of data collection. The obtained range of the age of the respondents on the basis of equal intervals are as follows:
   1) 19 – 25 years
   2) 26 – 32 years
   3) 33 – 39 years

ii. **Height of respondents:** The obtained range of the height of the respondents on the basis of equal intervals are as follows:
   1) 148 – 158 cm
   2) 159 – 169 cm
   3) 170 – 180 cm

iii. **Weight of respondents:** It referred to the weight of the respondents at the time of the data collection. The obtained range of the weight of the respondents on the basis of equal intervals are as follows:
   1) 43 – 56 kg
   2) 56 – 69 kg
   3) 69 – 82 kg

iv. **Marital Status:** It referred to the present marital status of the respondents at the time of data collection and was categorized as follows:
   1) Married
   2) Unmarried

v. **Years of service as a cashier (in months):** It referred to the respondent's number of years of service (in months) as a cashiers and the range was obtained on the basis of equal intervals are as follows:
   1) 12 – 60 months
   2) 61 – 109 months
   3) 110 – 158 months

vi. **Selected environmental parameters viz. noise, illumination, temperature and humidity:** It referred to noise, illumination,

temperature and humidity levels at checkout counters of selected retail stores (Table 1 & 2).

**Table 1: Categorization for the noise and illumination levels at checkout counters of selected retail stores**

| Noise | Illumination |
|---|---|
| **Morning shift (9:30-10:30am)** | |
| Below recommended level | Below recommended level |
| Above recommended level | Above recommended level |
| **Afternoon shift (1:30-2:30)** | |
| Below recommended level | Below recommended level |
| Above recommended level | Above recommended level |
| **Evening shift (5:30-6:30)** | |
| Below recommended level | Below recommended level |
| Above recommended level | Above recommended level |

Wagner et. al. (2007), conducted a research on thermal comfort and workplace occupant satisfaction and a research by Gahlot et.al (20017) conducted on assessment of workplace environment. Here, the temperature and humidity level were presented as below and above mean. Therefore, in the present study the temperature and humidity was presented as below and above mean.

**Table 2: Categorization for the temperature and humidity levels at checkout counters of selected retail stores**

| Temperature | Humidity |
|---|---|
| **Morning shift (9:30-10:30am)** | |
| Below mean | Below mean |
| Above or equal to mean | Above or equal to mean |
| **Afternoon shift (1:30-2:30)** | |
| Below mean | Below mean |
| Above or equal to mean | Above or equal to mean |
| **Evening shift (5:30-6:30)** | |
| Below mean | Below mean |
| Above or equal to mean | Above or equal to mean |

vii. **Extent of health problems experienced by the cashiers due to selected environmental parameters:** It referred to the extent to which the respondents experienced health problems experienced due to

selected environmental parameters viz. noise, illumination, temperature and humidity (Table 3).

**Table 3: Categorization and range of scores for extent of health problems experienced by the cashiers due to selected environmental parameters viz. noise, illumination, temperature and humidity**

| Sr.No. | Extent of Health problems experienced due to selected environmental parameters | Range of scores | | |
|---|---|---|---|---|
| | | High Extent | Some Extent | Low Extent |
| **A.** | **Noise** | | | |
| 1. | Physiological | 20-25 | 14-19 | 8-13 |
| 2. | Psychological | 23-29 | 16-22 | 9-15 |
| | **Total** | **41-52** | **29-40** | **17-28** |
| **B.** | **Illumination** | | | |
| 1. | Physiological | 17-21 | 12-16 | 7-11 |
| 2. | Psychological | 13-16 | 9-12 | 5-8 |
| | **Total** | **30-38** | **21-29** | **12-20** |
| **C.** | **Temperature and humidity** | | | |
| 1. | Physiological | 34-43 | 24-33 | 14-23 |
| 2. | Psychological | 16-20 | 11-15 | 6-10 |
| | **Total** | **48-61** | **34-47** | **20-33** |
| | **Overall** | **115-147** | **82-114** | **49-81** |

The scale consisted of items reflecting extent of health problems faced by the cashiers of selected retail stores. The health problems were categorized as physiological and psychological problems for different environmental parameters at checkout counters viz. noise, illumination temperature and humidity. The physiological health problems experienced by the cashiers due to noise considered were ringing of ears, headaches, drowsiness, dizziness, high blood pressure, impaired hearing, increase muscular tension, tiredness. The physiological health problems experienced by the cashiers due to illumination were eyestrain, blurred vision, red eyes, eye irritation, dry eyes and the physiological health problems experienced by the cashiers due to temperature and humidity were numbness, dryness in skin, itchy skin, flaky skin, migraine,

coughing and throat irritation, dry throat, nasal blockage, bleeding nose, muscle cramps, fainting, heat exhaustion dry eyes and frustration fatigue. The psychological health problems experienced by the cashiers due to noise, illumination, temperature and humidity were hindrance in conversation, encounter tiredness at work, difficulty in concentration, disturbance in ones performance of any task, stress, irritation, forget things due to disturbance, aggressive nature and frustration fatigue. The scores on each of the item of the scale were summated and possible range of minimum and maximum scores were divided into three categories having equal interval. The total numbers of items for the entire scale were 49 and hence minimum score was 49 and maximum was 147. Minimum and maximum possible scores were divided into three categories on the basis of equal interval which were “High Extent”, “Some Extent” and “Low Extent” of problems. It was determined for the entire scale (Table 3).

**Table 4: Categorization and range of scores for extent of physiological and psychological health problems experienced by the cashiers due to selected environmental parameters**

| Sr.no | Health problems | Mean score |
|---|---|---|
| **A** | **Physiological Problems** | |
| | To low extent | 29-48 |
| | To some extent | 49-68 |
| | To high extent | 69-87 |
| **B** | **Psychological problems** | |
| | To low extent | 18-30 |
| | To some extent | 31-42 |
| | To high extent | 43-54 |

The scale consisted of items reflecting extent of physiological and psychological health problems faced by the cashiers of selected retail stores. On the same scale the physiological and psychological health problems experienced by the cashiers due to noise, illumination, temperature and humidity were totaled up separately. The total numbers of items for physiological health problems were 29 and hence minimum score was 29 and maximum score was 87. Total numbers of items for psychological health problems were 18 and hence minimum score was

18 and maximum score was 54. Minimum and maximum possible scores were divided into three categories for the physiological and psychological health problems on the basis of equal interval which were “High Extent”, “Some Extent” and “Low Extent” of the problems. It was determined for the entire scale (Table 4).

viii. **Discomforts experienced by the cashiers:** It referred to the of discomfort experienced by the cashiers in different body parts while performing their task during last 12 months, during last 7 days and problem faced by the cashiers in carrying out their daily activities during last 12 months in different body parts viz. neck , shoulder, upper back, upper arm, lower back, forearm, wrist, hip, thigh, knee, ankles and feet (Table 5).

**Table 5: Categorization of discomforts experienced by the cashiers of selected retail stores**

| Discomforts experienced during last 12 months | Discomforts experienced during last 7 days | Discomforts that prevented the cashiers from carrying out their normal activities during last 12 months |
|---|---|---|
| Upper Body | Upper body | Upper body |
| Lower Body | Lower body | Lower body |

**3.9.2 Coding:** Coding is the process whereby the data are assigned a numerical code and value so that they can be more easily fitted into appropriate categories (Bhattacharya, 2004). Scores were given to each response, then the information from each scale of the interview schedule and record sheet were transferred on excel sheet.

**3.9.3 Tabulation:** Tabulation consists of counting the number of cases which fall into the established categories (Bhattacharya, 2004). The data were transferred from coding sheet into tabular form to give a clear picture of findings. The data of

the present research were tabulated to arrive at tables that were required for describing the data.

**3.9.4 Statistical Analysis:** The data were analysed employing descriptive as well as relational statistics.

**Descriptive statistics:** The data were presented in frequencies, percentage, mean and standard deviation.

**Relational statistics:** Analysis of Variance (ANOVA), t-test and co-efficient of Correlation were applied to test the hypotheses postulated for the study (Table 6).

**Table 6: Relational statistics applied to test the hypotheses**

| Test | Independent and Dependent Variables |
|---|---|
| (ANOVA) F-test | **Independent variables:** Age (in years), Years of service as a cashiers (in months), (section I)<br>**With**<br>**Dependent variable:** Extent of health problems experienced by the cashiers due to selected environmental parameters (Section II)<br>**and**<br>**Dependent variable:** Discomforts experienced by the cashiers during last 12 months (section III) |
| t-test | **Independent variables:** Gender (male or female) (section I)<br>**With**<br>**Dependent variable:** Extent of health problems experienced by the cashiers due to selected environmental parameters (section II)<br>**and**<br>**Dependent variable:** Discomforts experienced by the cashiers during last 12 months (section III) |
| (co-relation) r-test | **Independent variables:** Environmental parameters viz. noise and illumination levels at checkout counters of selected retail stores (section IV)<br>**With**<br>**Dependent variable:** Extent of health problems experienced by the cashiers due to selected environmental parameters (section II) |
| (co-relation) r-test | **Dependent variable:** Discomforts experienced by the cashiers during last 12 months (section III)<br>**With**<br>**Dependent Variable:** Discomforts that prevented them from carrying out their normal activities during last 12 months (Section III) |

# Findings and Discussion

# CHAPTER-IV

# FINDINGS AND DISCUSSION

The aim of the present study was to find out the extent of physiological and psychological health problems experienced by cashiers due to selected environmental parameters, to assess the discomfort experienced by the cashiers of selected retail stores, and to assess the environmental parameters of checkout counters of selected retail stores. In this study the retail stores were selected from Vadodara city and the cashiers of the retail stores were the key respondents.

This chapter deals with presenting, interpreting and discussing the findings obtained through analysis of the data collected through interview and record sheet. The results are presented in the following sub sections:

**4.1** Background Information

**4.1.1** Personal Information

**4.1.2** Situational Information

**4.1.2.1** Work related Information

**4.1.2.2** Level of noise, illumination, temperature and humidity

**4.2** Extent of Health Problems experienced due to selected environmental parameters

**4.3** Discomforts experienced by the cashiers

**4.4** Testing of Hypotheses

**4.5** Ergonomic Tips for Reducing Discomforts and Improving Environmental Parameters of Cashiers

## 4.1 Background Information of the respondents

This section deals with information regarding cashiers of selected retail stores of Vadodara city. The results regarding personal and situational variables of the respondents are presented here.

**4.1.1 Personal Information:** This section contained information regarding age (in years), gender, height (in cms), weight (in kg), marital status, years of service (in months) of the respondents.

**Table 7: Frequency and percentage distribution of the respondents according to their Personal Information**

| Sr. No. | Personal Information of the respondents | Respondents (n=61) | |
|---|---|---|---|
| **i.** | **Age (in years)** | **f** | **%** |
| | 19-25 | 40 | 65.57 |
| | 26-32 | 16 | 26.22 |
| | 33-39 | 5 | 8.19 |
| | **Mean** | **24.91** | |
| | **Standard Deviation** | **4.86** | |
| **ii.** | **Gender** | | |
| | Male | 33 | 54.09 |
| | Female | 28 | 45.9 |
| **iii.** | **Height (in cms)** | | |
| | 148-158 | 27 | 44.26 |
| | 159-169 | 21 | 34.43 |
| | 170-180 | 13 | 21.31 |
| | **Mean** | **162.51** | |
| | **Standard Deviation** | **8.38** | |
| **iv.** | **Weight (in kg)** | | |
| | 43-56 | 49 | 80.33 |
| | 56-69 | 11 | 18.03 |
| | 69-82 | 1 | 1.63 |
| | **Mean** | **51.91** | |
| | **Standard Deviation** | **6.53** | |
| **v.** | **Marital Status** | | |
| | Married | 24 | 39.34 |
| | Unmarried | 37 | 60.65 |
| **vi.** | **Years of Service as cashier (in months)** | | |
| | 12-60 | 57 | 93.44 |
| | 61-109 | 3 | 4.92 |
| | 110-158 | 1 | 1.63 |
| | **Mean** | **32.36** | |
| | **Standard Deviation** | **24.09** | |

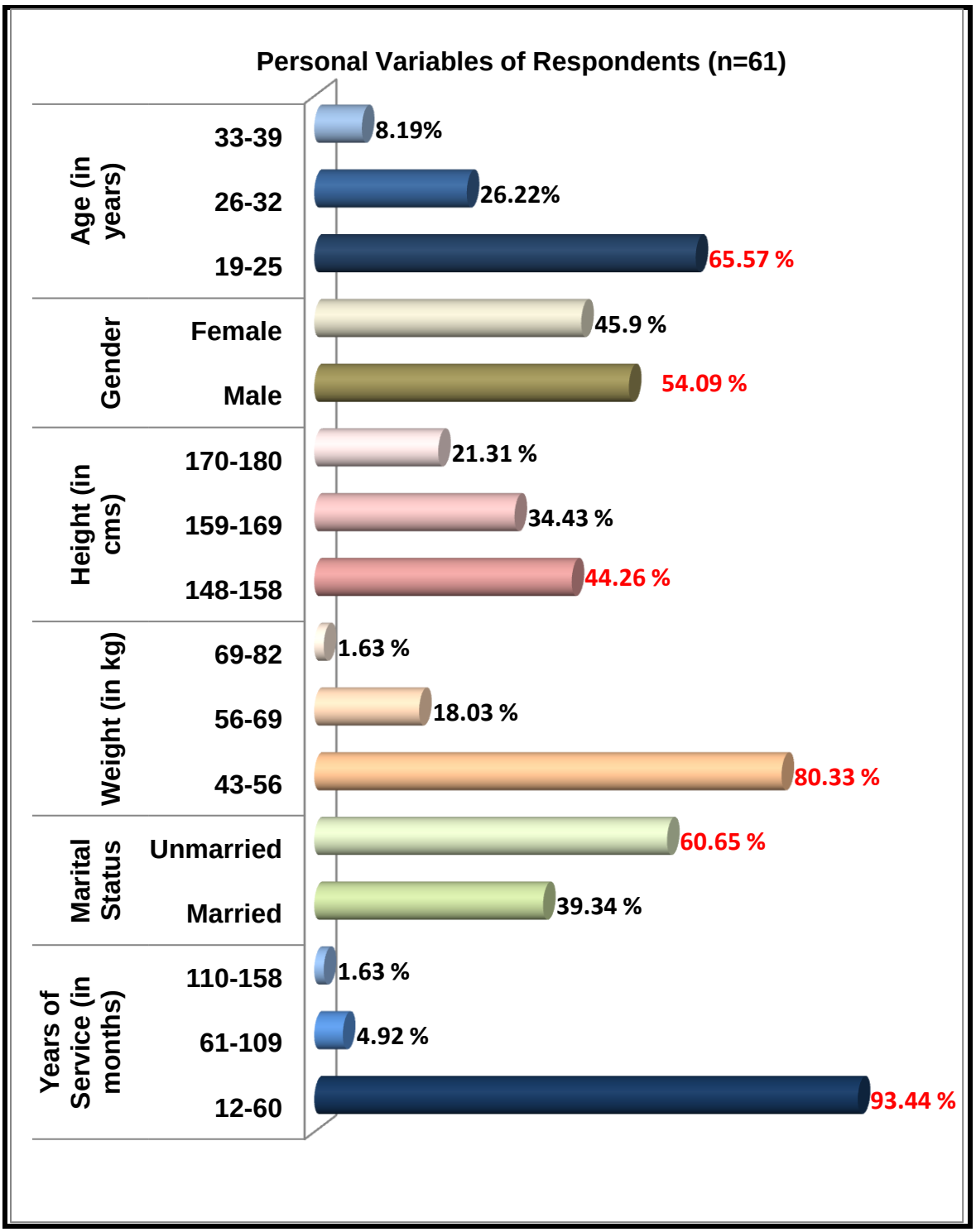



**Figure 6: Percentage distribution of the respondents according to their Personal Information**

**Age (in years):** The age of the respondents ranged between 19 to 39 years where mean age of the respondents was 24.91 years (**Table 7, Fig. 6**). A little less than two - third (65.57%) of the respondents were in age group of 19 to 25 years. A little more than one - fourth (26.22%) of the respondents were in age group of 26 to 32 years. A little less than one–tenth (8.19%) of the respondents were in age group of 33 to 39 years.

**Gender:** More than one - half (54.09%) of the respondents were males and less than one - half (45.9%) of the respondents were females (**Table 7 and Fig. 6**).

**Height (in cms):** The data from **table 7 and Fig 6** depicted that the height of the respondents ranged between 148 to 180 cms and the mean height was 162.51 cms. It was found that less than one - half (44.26 %) of the respondents were of height ranging between 148 to 158 cms. Little more than one - third (34.43%) of the respondents were of the height ranging between 159 to 169 cms and less than one - fourth (21.31%) of the respondents had height ranging between 170 to 180 cms.

**Weight (in kg):** The weight of the respondents ranged between 43 to 82 kg and the mean weight was 51.91kg. Majority (80.33%) of the respondents had weight between 43 to 56 kg while 18.03 per cent of the respondents weighed between 56 to 69 kg. Only one respondent was of weight ranging between 69 to 82 kg (**Table 7 and Fig. 6**).

**Marital status:** From **table 7 and Fig. 6** the data revealed that less than two - third (60.65%) of the respondents were unmarried and 39.34 per cent of the respondents were married.

**Years of Service as cashier (in months):** The years of service of the respondents as cashier ranged between 12 to 110 months with the mean of 32.36 years. It was found that majority (93.44%) of the respondents had worked as cashier for past 12 to 60 months whereas 4.92 per cent of the respondents

were working as cashier since 69 to 109 months and only one respondent was found who worked as cashier for past 110 to 158 months (**Table 7 and Fig. 6**).

**4.1.2 Situational Information:** In this section, work related information were gathered. The selected environmental parameters of checkout counters of selected retail stores viz. noise, illumination temperature and humidity were also assessed.

**4.1.2.1 Work related information:** This section deals with information related to number of working days in a week, total working hours per day, number of breaks in a day and duration of each break in a day were collected.

**Table 8: Frequency and percentage distribution of respondents according to their work related information**

| Sr. No | Work related information (n=61) | | | | |
|---|---|---|---|---|---|
| I. | Number of break | | F | | % |
| | 1-2 | | 50 | | 81.96 |
| | 3-4 | | 11 | | 18.03 |
| | Mean | | 1.98 | | |
| II. | Duration of each break in a day | | | | |
| | Types of break | Duration of breaks | Number of breaks | f | % |
| i. | Tea/coffee | 15 min | 1 | 50 | 81.96 |
| | | 15min | 2 | 11 | 18.03 |
| ii. | Lunch | 30min | 1 | 18 | 29.50 |
| | | 60min | 1 | 43 | 70.49 |

It was found that all the respondents of selected retail stores had 6 working days in a week and their working hours were 9 hours per day. The data in **table 8 and Fig.7** depicted that majority (81.96%) of the respondents had 1 to 2 breaks in a day and 18.03 per cent of the respondents had 3 to 4 breaks in a day. The duration of tea/coffee breaks in a day was 15 minutes and lunch breaks was 30 to 60 minutes in a day at selected retail stores. Majority (81.96%) of the respondents had one tea/coffee break in a day and 18.03 per cent of the respondents had two tea/coffee breaks in a day. It was also found that less than three - fourth (70.49%) of the respondents had one lunch break of 60 minutes in

a day while and more than one - fourth (29.50%) of the respondents had one lunch break of 30 minutes in a day.

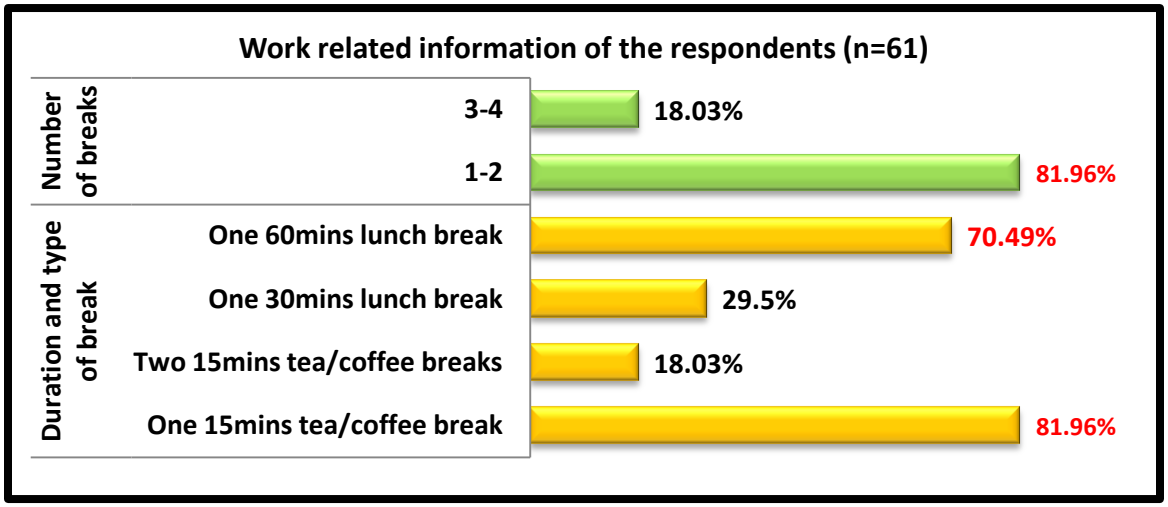



**Figure 7: Percentage distribution of the respondents according to their work related Information**

**Table 9: Frequency and percentage distribution of respondents according to any musculoskeletal problem faced by them before joining as cashier at the present retail store**

| Respondents (n=61) | | |
|---|---|---|
| **Musculoskeletal problem faced before joining as cashier at the present retail store** | **f** | **%** |
| Yes | 0 | 0.00 |
| No | 61 | 100 |

From **table 9 and Fig. 8**, it was found that all of the respondents reported that they did not had any musculoskeletal problems before joining as cashier at the present retail stores.

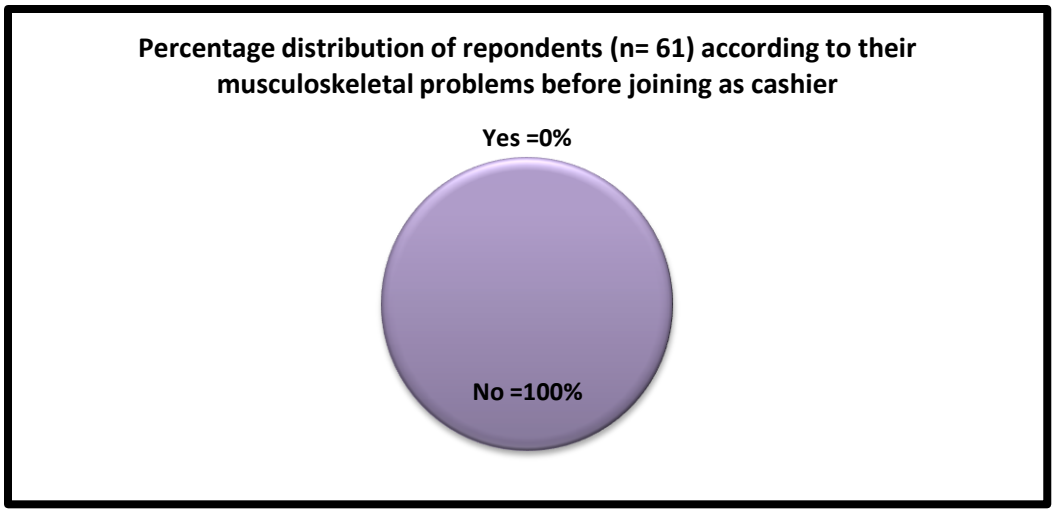



**Figure 8: Percentage distribution of the respondents according to their musculoskeletal problems before joining as cashier at the present retail store**

**4.1.2.2 Environmental Parameters viz. Noise, Illumination, Temperature and Humidity:** In this section noise, illumination, temperature and humidity of each retail stores were recorded through noise meter, lux meter and thermo-hygrometer respectively. The readings of noise, illumination, temperature and humidity were recorded at 3 spots of the checkout counters of each selected retail stores during three different shifts. First the readings were recorded at spot 1 and after 5 minutes at spot 2 and again after 5 minutes at spot 3. This process was repeated for three times in a day during different shifts i.e morning (9:30a.m – 10:30a.m), afternoon (1:30a.m – 2:30p.m) and evening (5:30p.m – 6:30p.m).The average was computed for noise, illumination, temperature and humidity and are presented here.

**Noise:** According to Rangwala, 2014 the recommended noise for retail stores is 50-60 dB. It was found that among the 9 retail stores, store 1 had the higher noise level than the recommended levels during morning shift (73.2 dB) and store 3 had the higher noise level than the recommended level during afternoon (82.3dB) and evening shift (86.6dB) (Plate 4). The **table 10 and Fig. 9** also depicted that all the selected retail stores had excess dB (decibels) than recommended noise (dB) which was found more during evening shift (21.3dB).

**Table 10: Average Noise at checkout counters of the selected retail stores during different shifts**

| Stores | Average noise level (in dB) at Checkout counters of Retail Stores (n=9) | | |
|---|---|---|---|
| | Morning (9:30a.m-10:30a.m) | Afternoon (1:30p.m-2:30p.m) | Evening (5:30p.m-6:30p.m) |
| 1 | 73.2 | 77 | 80.3 |
| 2 | 68.8 | 78.1 | 82.6 |
| 3 | 62.5 | 82.3 | 86.6 |
| 4 | 65.3 | 76.9 | 79.9 |
| 5 | 69.1 | 78.3 | 78.6 |
| 6 | 64.6 | 78.3 | 82 |
| 7 | 68.3 | 79.3 | 83 |
| 8 | 70.6 | 71.3 | 79.3 |
| 9 | 68.6 | 78 | 79.6 |
| **Average** | **67.8** | **77.7** | **81.3** |
| **Recommended dB level** | **60** | **60** | **60** |
| **Excess dB** | **7.8 (13%)** | **17.7 (29.5%)** | **21.3 (35.5%)** |

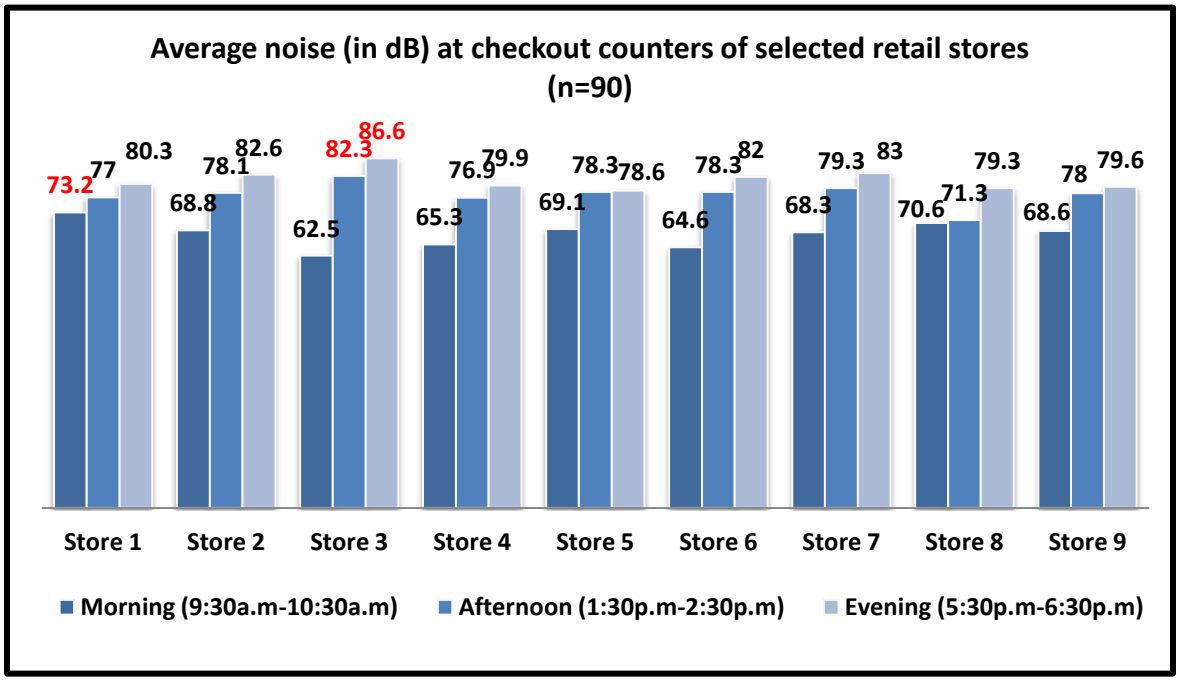



**Figure 9: Average noise (in dB) at checkout counters of the selected retail stores during different shifts**

Further, the average noise during different shifts of selected retail stores was calculated and presented here as below and above the recommendation level 60 dB.

**Table 11: Frequency and percentage distribution of retail stores according to noise below and above the recommended level**

| Recommended level of Noise (60 dB) | Retail stores (n=9) | | | | | |
|---|---|---|---|---|---|---|
| | Morning shift (9:30-10:30am) | | Afternoon (1:30-2:30am) | | Evening (5:30-6:30am) | |
| | f | % | f | % | f | % |
| Above 60dB | 9 | 100 | 9 | 100 | 9 | 100 |

**Table 11** revealed that the noise observed and recorded for selected retail stores reflected that all the stores had noise above the recommended level i.e 60 dB during all the three shifts viz. morning, afternoon and evening.

**Plate 4: Recording noise with noise meter at checkout counter**

**Illumination:** According to Chauhan 2016, the recommended illumination for retail stores is 500 lux. In **table 12 and Fig.10** it was found that among the nine stores the illumination level at store 4 and 6 was found higher than the recommended level during the three shifts viz. morning (1425.3 lux), afternoon (1457 lux), evening (1425.3 lux) and morning (1386.3 lux), afternoon (1456.3 lux), afternoon (1399 lux) respectively. It was also found that store 3 had the lowest illumination level during the three shifts i.e morning (80.33 lux), afternoon (80 lux), evening (77.3 lux). It was also found that excess illumination than recommended level was found higher during the afternoon shift (229.56 lux) (Plate 5 & 6).

**Table 12: Average Illumination at checkout counters of the selected retail stores during different shifts**

| Stores | Average illumination (in lux) at Checkout counters of Retail Stores (n=9) | | |
|---|---|---|---|
| | **Morning shift (9:30a.m-10:30a.m)** | **Afternoon shift (1:30p.m-2:30p.m)** | **Evening shift (5:30p.m-6:30p.m)** |
| 1 | 538 | 469.3 | 609 |
| 2 | 693.3 | 692.3 | 709 |
| 3 | 80.33 | 80 | 77.3 |
| 4 | 1425.3 | 1457 | 1425.3 |
| 5 | 540 | 625.3 | 560 |
| 6 | 1386.3 | 1456.3 | 1399 |
| 7 | 568 | 570 | 573.3 |
| 8 | 571 | 651.6 | 618 |
| 9 | 565.6 | 564.3 | 564.3 |
| **Average** | **707.53** | **729.56** | **726.13** |
| **Recommended lux level** | **500** | **500** | **500** |
| **Excess lux** | **207.53 (41.5%)** | **229.56 (45.91%)** | **226.13 (45.22%)** |

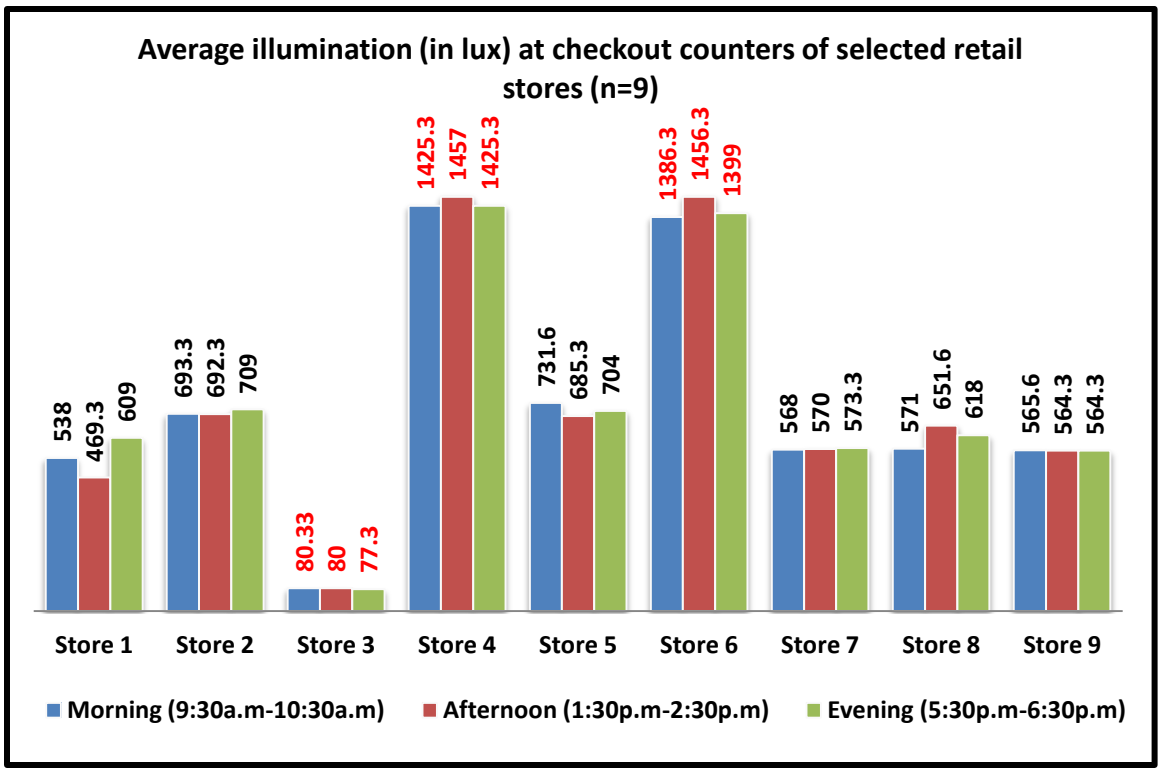



**Figure 10: Average illumination (in lux) at checkout counters of the selected retail stores during different shifts**

The average illumination during different shifts of selected retail stores was computed and presented here as below and above the recommendation level i.e 500 lux.

**Table 13: Frequency and percentage distribution of retail stores according to illumination below and above the recommended levels**

| Recommended level of Illumination (500 Lux) | Retail stores (n=9) | | | | | |
|---|---|---|---|---|---|---|
| | Morning shift (9:30-10:30am) | | Afternoon (1:30-2:30am) | | Evening (5:30-6:30am) | |
| | f | % | f | % | f | % |
| Below 500 lux | 1 | 11.11 | 1 | 11.11 | 1 | 11.11 |
| Above 500 lux | 8 | 88.88 | 8 | 88.88 | 8 | 88.88 |

Majority (88.88%) of the stores had illumination level above the recommended level i.e. 500 lux during all the three shifts viz. morning, afternoon and evening and only 11.11 per cent of the stores had illumination below the recommended level i.e 500 lux (**Table 13**).

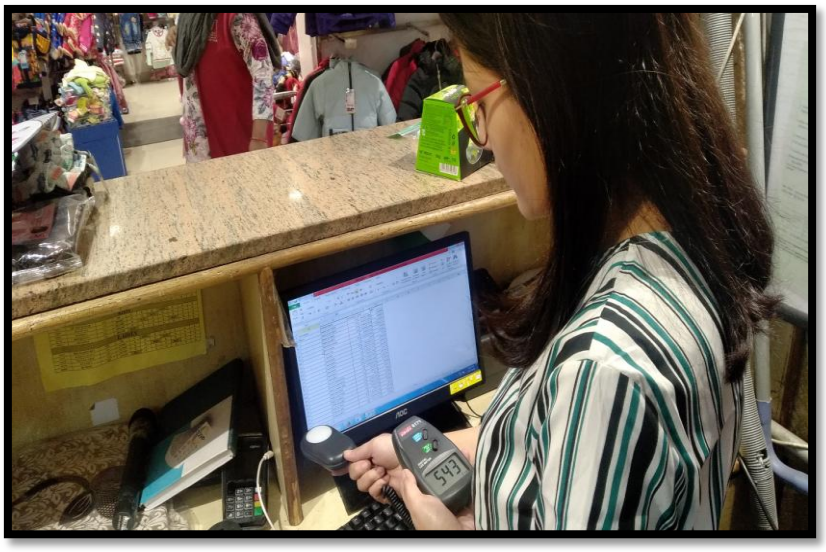


**Plate 5: Recording illumination with lux meter at checkout counter**


**Plate 6: Recording illumination with lux meter at checkout counter**

**Temperature:** Data in **table 14 and Fig. 11** revealed that store 1 had highest temperature levels during all three shifts i.e, 29.1$^{o}$C during morning time, 29.1$^{o}$C during afternoon and 31.6$^{o}$C during evening as compared to other stores (Plate 7). The average temperature of all the stores was found higher during morning shift (26.82$^{o}$C) at checkout counters of all the selected retail stores.

**Table 14: Average Temperature at checkout counters of the selected retail stores during different shifts**

| Stores | Average temperature (in $^{o}$C) at checkout counters of retail stores (n=9) | | |
|---|---|---|---|
| | Morning shift (9:30a.m-10:30a.m) | Afternoon shift (1:30p.m-2:30p.m) | Evening shift (5:30p.m-6:30p.m) |
| 1 | 29.1 | 29.8 | 31.6 |
| 2 | 29.03 | 22.3 | 24.6 |
| 3 | 27.7 | 26.6 | 24.4 |
| 4 | 24.1 | 23.6 | 22.3 |
| 5 | 28.2 | 23 | 22.3 |
| 6 | 24 | 22 | 22.3 |
| 7 | 28.03 | 23 | 24.6 |
| 8 | 27 | 23.3 | 22 |
| 9 | 24.3 | 22.3 | 21.3 |
| **Average** | **26.82** | **23.98** | **23.93** |

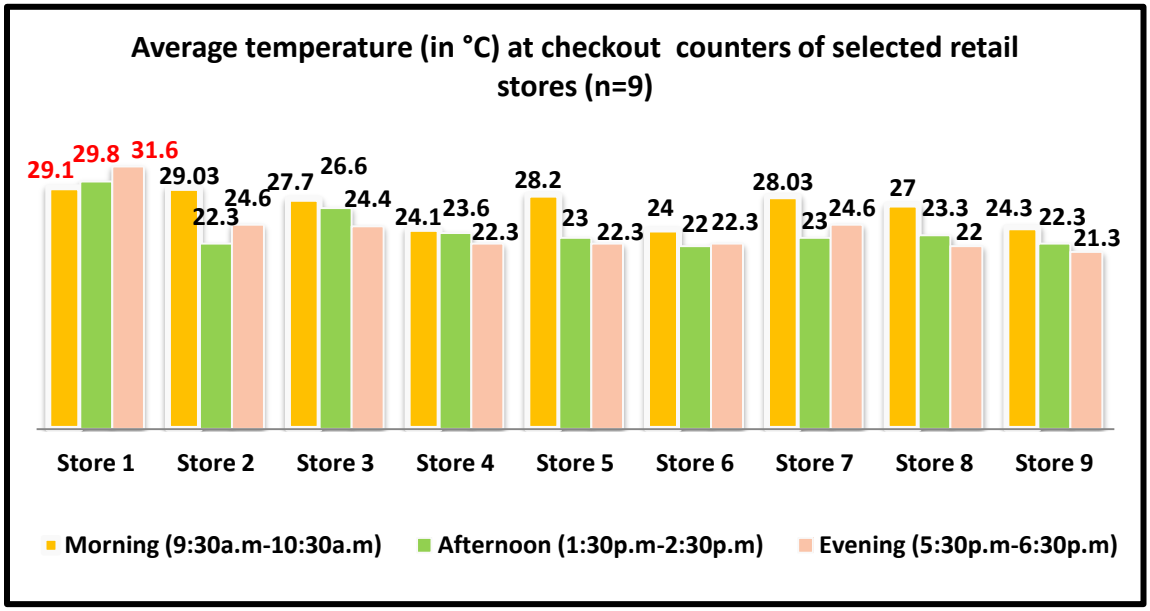



**Figure 11: Average temperature (in $^{o}$C) at checkout counters of the selected retail stores during different shifts**

The temperature of the selected retail stores were calculated and presented as below and above mean for the all the three shifts viz. morning, afternoon and evening.

**Table 15: Frequency and percentage distribution of retail stores according to temperature below and above or equal to mean during all the three shifts**

| Mean | Retail stores (n=9) | |
|---|---|---|
| | f | % |
| **Temperature ($^{o}$C)** | | |
| **Morning shift (9:30-10:30am) (mean= 26.82)** | | |
| Below mean | 3 | 33.33 |
| Above or equal to mean | 6 | 66.66 |
| **Afternoon shift (1:30-2:30) (mean= 23.98)** | | |
| Below mean | 7 | 77.77 |
| Above or equal to mean | 2 | 22.22 |
| **Evening shift (5:30-6:30) (mean= 23.93)** | | |
| Below mean | 5 | 55.55 |
| Above or equal to mean | 4 | 44.44 |

The data in **table 15** depicted that the mean temperature during morning shift was 26.82. Two – third (66.66%) of the stores had temperature above or equal to the calculated mean. The mean temperature during afternoon shift was 23.98 and more than three-fourth (77.77%) of the stores had temperature below the calculated mean. Further, the mean temperature of evening shift was 23.93 and more than one - half (55.55%) of the stores had temperature below the calculated mean.

**Humidity:** From **table 16 and Fig. 12,** it can be concluded that the highest humidity level at checkout counters of selected retail stores during morning shift was recorded from store 5 (61.6%). During afternoon time, it was found that store 1 and store 8 had higher humidity (61.6%). Store 1 had higher humidity (72.33%) in the evening as noted during observation. The average humidity was found high during the morning shift (57.81%).

**Table 16: Average humidity at checkout counters of the selected retail stores during different shifts**

| Stores | Average humidity (in %) at checkout counters of the selected retail stores (n=9) | | |
|---|---|---|---|
| | Morning (9:30a.m-10:30a.m) | Afternoon (1:30p.m-2:30p.m) | Evening (5:30p.m-6:30p.m) |
| 1 | 58 | 61.6 | 72.33 |
| 2 | 61 | 51.3 | 52 |
| 3 | 59 | 50.6 | 60.6 |
| 4 | 50.6 | 50 | 49 |
| 5 | 61.6 | 50 | 51.3 |
| 6 | 50.6 | 50 | 51.3 |
| 7 | 61.3 | 50.6 | 60.6 |
| 8 | 57.6 | 61.6 | 50 |
| 9 | 60.6 | 50.6 | 49.6 |
| **Average** | **57.81** | **52.92** | **55.19** |

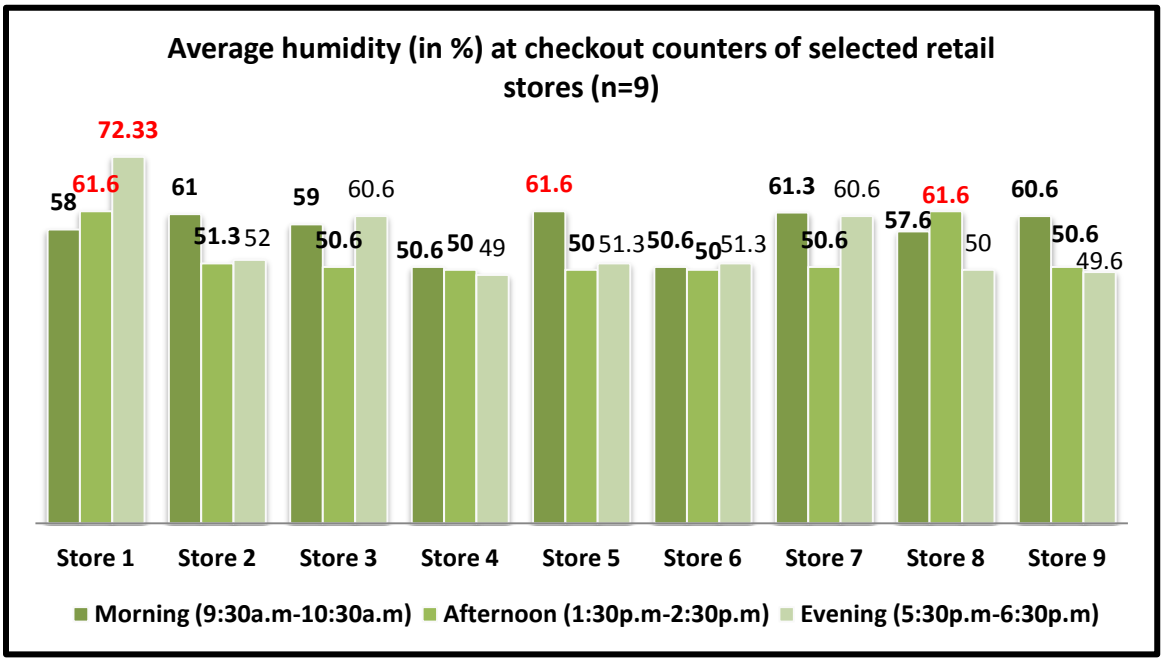



**Figure 12: Average humidity (in %) at checkout counters of the selected retail stores during different shifts**

The humidity of the selected retail stores were computed and presented as below and above or equal to mean for the all the three shifts viz. morning, afternoon and evening.

**Table 17: Frequency and percentage distribution of retail stores according to humidity below and above or equal to mean during all the three shifts**

| Mean | Retail Stores (n=9) | |
|---|---|---|
| | f | % |
| **Humidity (%)** | | |
| **Morning shift (9:30-10:30am) (mean= 57.81)** | | |
| Below mean | 3 | 33.33 |
| Above or equal to mean | 6 | 66.66 |
| **Afternoon shift (1:30-2:30) (mean= 52.92)** | | |
| Below mean | 7 | 77.77 |
| Above or equal to mean | 2 | 22.22 |
| **Evening shift (5:30-6:30) (mean= 55.19)** | | |
| Below mean | 6 | 66.66 |
| Above or equal to mean | 3 | 33.33 |

The mean humidity during morning shift was recorded as 58 %. Three -fourth (66.66%) of the stores had humidity above or equal to the calculated mean during morning shift. The mean humidity level during afternoon shift was found as 53% (Plate 7). More than three-fourth (77.77%) of the stores had humidity below the calculated mean during afternoon time. Moreover, the mean humidity during evening shift was recorded as 55%. Three -fourth (66.66%) of the stores had humidity below the computed mean during evening (**Table 17**).

**Plate 7: Recording temperature and humidity with thermo-hygro meter at checkout counter**

## 4.2 Extent of Health Problems experienced by the cashiers due to selected environmental parameters

An attempt was made to find out the experienced physiological and psychological health problems of the cashiers as perceive by them which occurred due to selected environmental parameter of checkout counters of selected retail stores. Physiological and psychological health problems that may be caused due noise, illumination, temperature and humidity among the cashiers were listed based on extensive literature reviewed. It had 3 point continuum for the responses “To High Extent”, “To Some Extent” and “To Low Extent” which were scored 3 through 1 respectively. High scores reflected high extent of health problems experienced due to noise, illumination, temperature and humidity at checkout counters of selected retail stores.

**4.2.1 Noise:** The experienced health problems were categorized as physiological and psychological health problems experienced due to noise at checkout counters of selected retail stores. The physiological health problems experienced due to noise considered were ringing of ears, headaches, drowsiness, dizziness, high blood pressure, impaired hearing, increase muscular tension, tiredness. The psychological health problems experienced due to noise were hindrance in conversation, encounter tiredness at work, difficulty in concentration, disturbance in ones performance of any task, stress, irritation, forget things due to disturbance, aggressive nature and frustration fatigue. The responses were recorded as perceived by the cashiers.

**Physiological Health Problems experienced due to Noise:** The data in **table 18 and Fig. 13**, revealed that less than three fourth (70.49%) of the respondents experienced tiredness to high extent due to noise level at checkout counters while more than one - half (55.73%) of the respondents had headache to some extent. All of the respondents suffered from high blood pressure to low extent due to noise. The mean weighted scores were found high for physiological health

problems viz. tiredness (2.68), headaches (2.40) and increased muscular tension (2.32).

**Table 18: Frequency and percentage distribution of respondents according to extent of physiological health problems experienced due to Noise at checkout counters**

| Sr. No. | Physiological Health problems experienced due to Noise | Respondents (n=61) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | To High Extent | | To Some Extent | | To Low Extent | | Wt. Mean score (3 – 1) |
| | | f | % | f | % | f | % | |
| i. | Ringing of ears | 00 | 0.00 | 06 | 9.83 | 55 | 90.16 | 1.09 |
| ii. | Headaches | 26 | 42.62 | 34 | 55.73 | 01 | 1.63 | 2.40 |
| iii. | Drowsiness | 02 | 3.27 | 31 | 50.81 | 28 | 45.90 | 1.57 |
| iv. | Dizziness | 02 | 3.27 | 12 | 19.67 | 47 | 77.04 | 1.26 |
| v. | High blood pressure | 00 | 0.00 | 00 | 0.00 | 61 | 100 | 1 |
| vi. | Impaired hearing | 00 | 0.00 | 01 | 1.63 | 60 | 98.36 | 1.01 |
| vii. | Increase muscular tension | 27 | 44.26 | 27 | 44.26 | 07 | 11.47 | 2.32 |
| viii. | Tiredness | 43 | 70.49 | 17 | 27.86 | 01 | 1.63 | 2.68 |
| | **Total** | | | | | | | **1.67** |

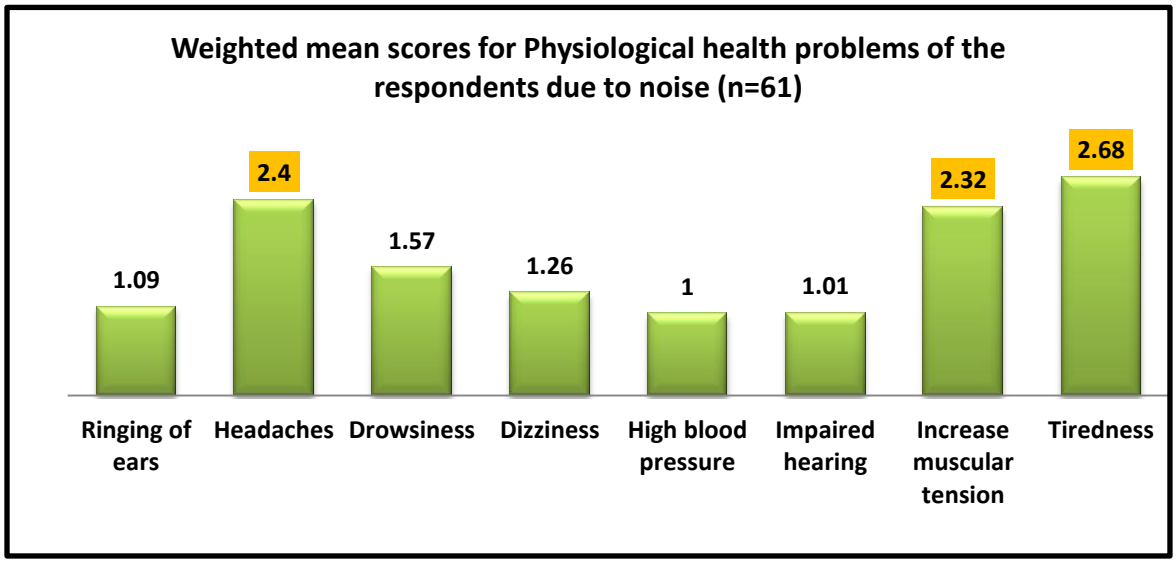



**Figure 13: Weighted mean scores for Physiological health problems experienced due to noise at checkout counters**

**Psychological Health problems experienced due to Noise:** Data in **Table 19 and Fig. 14** revealed that less than two-third (62.29%) of the respondents experienced stress to high extent due to Noise. More than two-third (67.21%) of

the respondents faced some extent of hindrance in conversation due to noise. Less than three – fourth (72.12%) of the respondents tend to forget things due to noise disturbance. The mean weighted scores were found high for psychological health problems such as stress (2.62), frustration fatigue (2.52) and aggressive nature (2.50).

**Table 19: Frequency and percentage distribution of respondents according to extent of psychological health problems experienced due to Noise at checkout counters**

| Sr. No. | Psychological Health problems experienced due to Noise | Respondents (n=61) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | To High Extent | | To Some Extent | | To Low Extent | | Wt. Mean score (3 – 1) |
| | | f | % | f | % | f | % | |
| i. | Hindrance in conversation | 01 | 1.63 | 41 | 67.21 | 19 | 31.14 | 1.70 |
| ii. | Encounter tiredness at work | 32 | 52.45 | 25 | 40.98 | 04 | 6.55 | 2.45 |
| iii. | Difficulty in concentration | 00 | 0.00 | 39 | 63.93 | 22 | 36.06 | 1.63 |
| iv. | Disturbance in ones performance of any task | 01 | 1.63 | 39 | 63.93 | 21 | 36.06 | 1.67 |
| v. | Stress | 38 | 62.29 | 23 | 37.70 | 00 | 0.00 | 2.62 |
| vi. | Irritation | 27 | 44.26 | 34 | 55.73 | 00 | 0.00 | 2.44 |
| vii. | Forget things due to disturbance | 00 | 0.00 | 17 | 27.86 | 44 | 72.13 | 1.27 |
| viii. | Aggressive nature | 32 | 52.45 | 28 | 45.90 | 01 | 1.63 | 2.50 |
| ix. | Frustration fatigue | 36 | 59.01 | 21 | 34.42 | 04 | 6.55 | 2.52 |
| | **Total** | | | | | | | **2.1** |

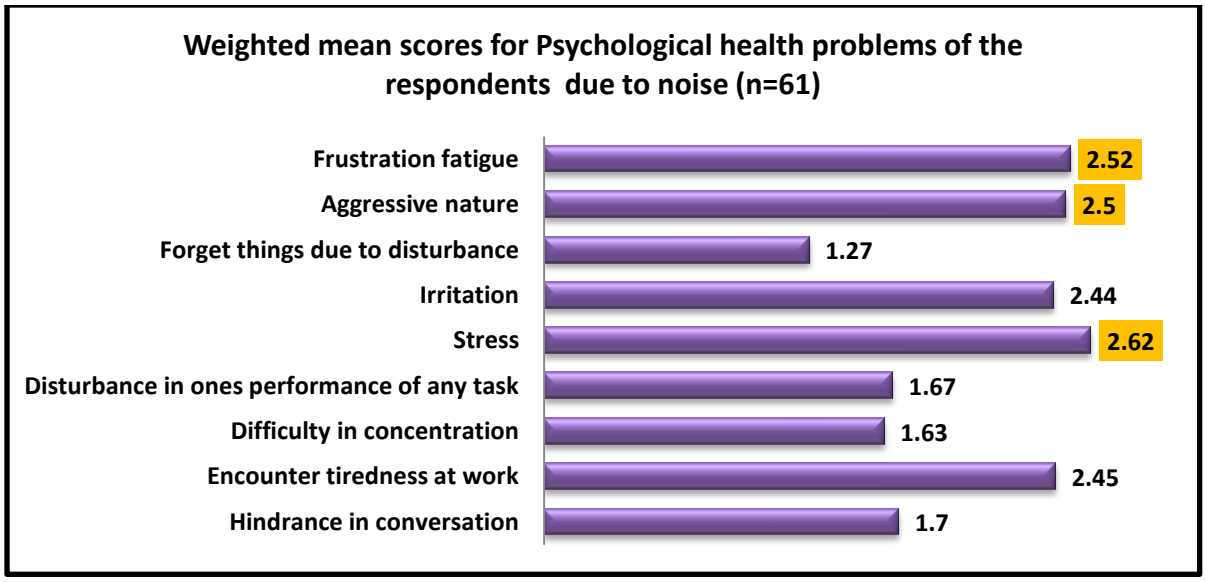



**Figure 14: Weighted mean scores for Psychological health problems experienced due to noise at checkout counters**

**4.2.2 Illumination:** The health problems were categorized as physiological and psychological health problems experienced due to illumination at checkout counters of selected retail stores. The physiological health problems experienced due to illumination were eyestrain, headaches, blurred vision, burning of eyes, red eyes, eye irritation and dry eyes. The psychological problems of the cashiers were stress, irritation, frustration fatigue, aggressive nature and difficulty in performing tasks. The responses were recorded as perceived by the cashiers.

**Table 20: Frequency and percentage distribution of respondents according to extent of physiological health problems experienced due to Illumination at checkout counters**

| Sr. No. | Physiological Health problems experienced due to Illumination | Respondents (n=61) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | To High Extent | | To Some Extent | | To Low Extent | | Wt. Mean score (3 – 1) |
| | | f | % | f | % | f | % | |
| i. | Eyestrain | 41 | 67.21 | 20 | 32.78 | 00 | 0.00 | 2.67 |
| ii. | Headaches | 39 | 63.93 | 22 | 37.70 | 00 | 0.00 | 2.63 |
| iii. | Blurred vision | 10 | 16.39 | 30 | 49.18 | 21 | 34.42 | 1.81 |
| iv. | Burning of eyes | 17 | 27.86 | 36 | 59.01 | 08 | 13.11 | 2.14 |
| v. | Red eyes | 05 | 8.19 | 33 | 55.73 | 23 | 37.70 | 1.70 |
| vi. | Eye irritation | 12 | 19.67 | 23 | 37.70 | 26 | 42.62 | 1.77 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| vii. | Dry eyes | 03 | 4.91 | 08 | 13.11 | 50 | 81.96 | 1.22 |
| | **Total** | | | | | | | **1.99** |

**Physiological Health problems experienced due to Illumination:** From **table 20 and Fig.15,** it can be concluded that more than two - third (67.21%) of the respondents faced high extent of eyestrain due to illumination. Less than two - third (59.01%) of the respondents experienced burning of eyes to some extent due to illumination level. Majority (81.96%) of the respondents had dry eyes problem to low extent due to the illumination at checkout counters. The mean weighted score were found high for physiological health problems such as eyestrain (2.67), headache (2.63) and burning of eyes (2.14).

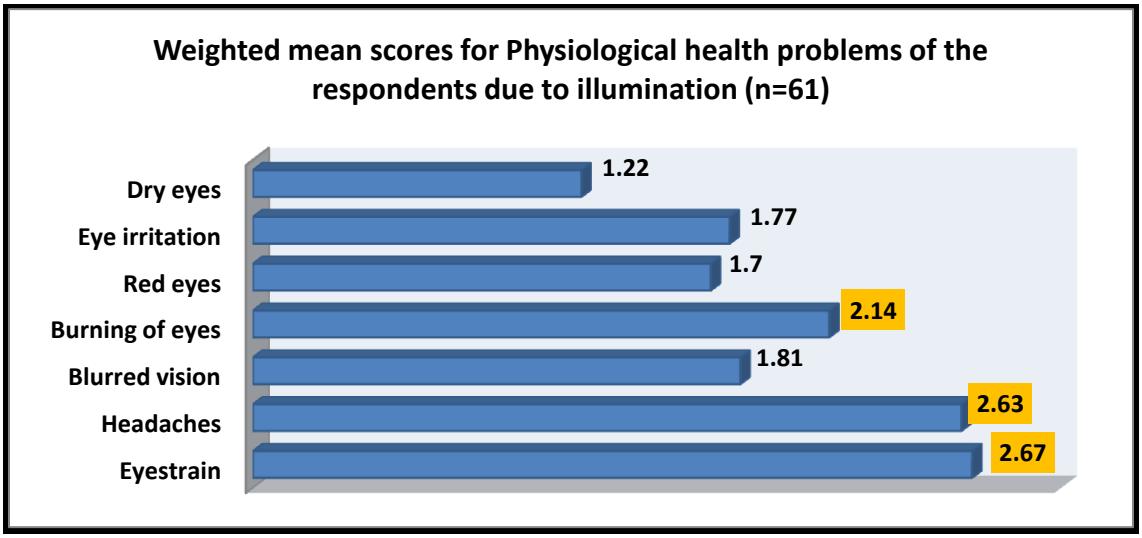



**Figure 15: Weighted mean scores for Physiological health problems experienced due to illumination at checkout counters**

**Psychological health problems experienced due to Illumination:** The data in **table 21 and Fig. 16** depicted that less than two-third (63.93%) of the respondents experienced stress to high extent due to illumination level at checkout counters. Less than two – third (65.57%) of the respondents faced difficulty in performing any tasks to some extent due to illumination while 18.03 per cent of the respondents faced this problem to low extent. The weighted mean score were found high for psychological health problem such as stress (2.59), frustration fatigue (2.47) and aggressive nature (2.44).

**Table 21: Frequency and percentage distribution of respondents according to extent of psychological health problems experienced due to illumination at checkout counters**

| Sr. No. | Psychological Health problems experienced due to Illumination | Respondents (n=61) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | To High Extent | | To Some Extent | | To Low Extent | | Wt. Mean score (3 – 1) |
| | | f | % | f | % | f | % | |
| i. | Stress | 39 | 63.93 | 19 | 31.14 | 03 | 4.91 | 2.59 |
| ii. | Irritation | 24 | 39.34 | 34 | 55.73 | 03 | 4.91 | 2.34 |
| iii. | Frustration fatigue | 32 | 54.45 | 26 | 42.62 | 03 | 4.91 | 2.47 |
| iv. | Aggressive nature | 30 | 49.18 | 28 | 45.90 | 03 | 4.91 | 2.44 |
| v. | Difficulty in performing any tasks | 10 | 16.39 | 40 | 65.57 | 11 | 18.03 | 1.98 |
| | **Total** | | | | | | | **2.36** |

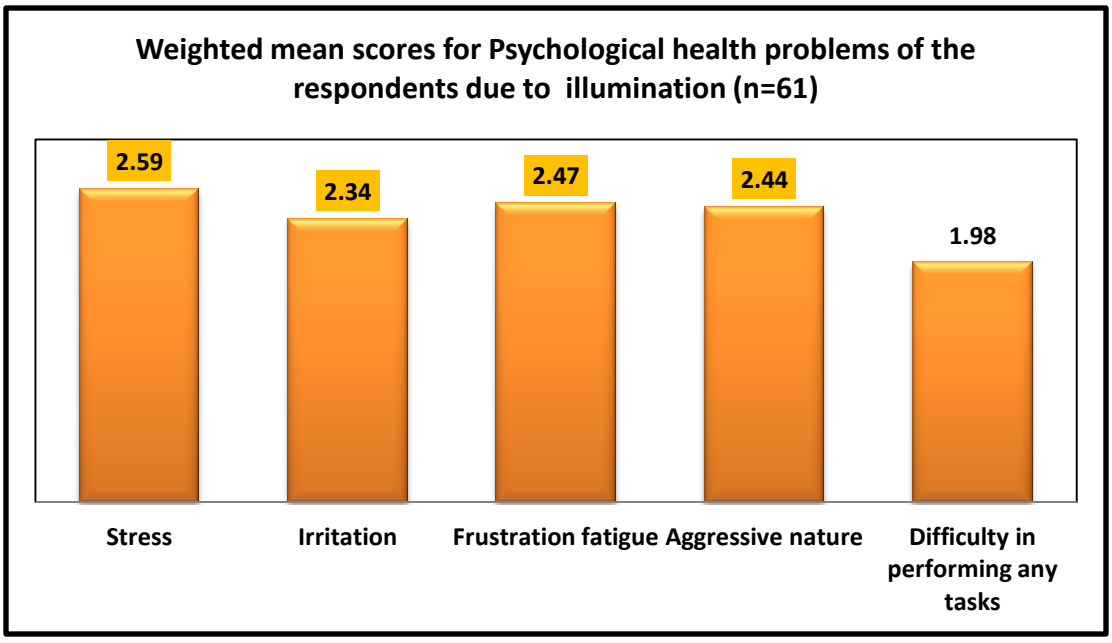



**Figure 16: Weighted mean scores for Psychological health problems experienced due to illumination at checkout counters**

**4.2.3 Temperature and Humidity:** The health problems were categorized as physiological and psychological health problems experienced due to temperature and humidity at checkout counters of selected retail stores. The physiological health problems experienced due to temperature and humidity were numbness, dryness in skin, itchy skin, flaky skin, migraine, coughing and throat irritation, dry

throat, nasal blockage, bleeding nose, muscle cramps, fainting, heat exhaustion dry eyes and frustration fatigue. The psychological problems of the cashiers were stress, irritation, frustration fatigue, aggressive nature and difficulty in performing tasks. The responses were recorded as perceived by the cashiers.

**Table 22: Frequency and percentage distribution of respondents according to extent of physiological health problems experienced due to temperature and humidity at checkout counters**

| Sr. No. | Physiological Health problems experienced due to Temperature and Humidity | Respondents (n=61) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | To High Extent | | To Some Extent | | To Low Extent | | Wt. mean score (3 – 1) |
| | | f | % | f | % | f | % | |
| i. | Numbness | 00 | 0.00 | 00 | 0.00 | 61 | 100 | 1 |
| ii. | Dryness in skin | 16 | 26.22 | 20 | 32.78 | 25 | 40.98 | 1.85 |
| iii. | Itchy skin | 00 | 0.00 | 03 | 4.91 | 58 | 95.08 | 1.04 |
| iv. | Flaky skin | 06 | 9.83 | 15 | 24.59 | 40 | 65.57 | 1.44 |
| v. | Migraine | 03 | 4.91 | 05 | 8.19 | 53 | 86.88 | 1.18 |
| vi. | Coughing and throat irritation | 03 | 4.91 | 35 | 57.37 | 23 | 37.70 | 1.67 |
| vii. | Dry throat | 02 | 3.27 | 37 | 60.65 | 22 | 36.06 | 1.67 |
| viii. | Nasal blockage | 02 | 3.27 | 25 | 40.98 | 34 | 55.73 | 1.47 |
| ix. | Bleeding nose | 01 | 1.63 | 00 | 0.00 | 60 | 98.36 | 1.03 |
| x. | Muscle cramps | 26 | 42.62 | 29 | 47.54 | 06 | 9.83 | 2.32 |
| xi. | Fainting | 00 | 0.00 | 01 | 1.63 | 60 | 98.36 | 1.01 |
| xii. | Heat exhaustion | 00 | 0.00 | 05 | 8.19 | 56 | 91.80 | 1.08 |
| xiii. | Dry eyes | 09 | 14.75 | 19 | 31.14 | 33 | 54.09 | 1.60 |
| xiv. | Frustration fatigue | 38 | 62.29 | 21 | 34.42 | 02 | 3.27 | 2.59 |
| | **Total** | | | | | | | **1.5** |

**Physiological Health problems experienced due to Temperature and Humidity:** The data in **table 22 and Fig. 17** depicted that less than two - third (62.29%) of the respondents experienced frustration fatigue to high extent due to temperature and humidity at checkout counters. Less than two - third (60.65%) of the respondents had experienced dryness in throat to some extent due to temperature and humidity. Majority (98.36%) of the respondents had experienced nasal blockage and fainting to low extent due to temperature and humidity at checkout counters. The mean weighted score were found high for physiological

health problem viz. frustration fatigue (2.59), muscle cramps (2.32) and dryness in skin (1.85).

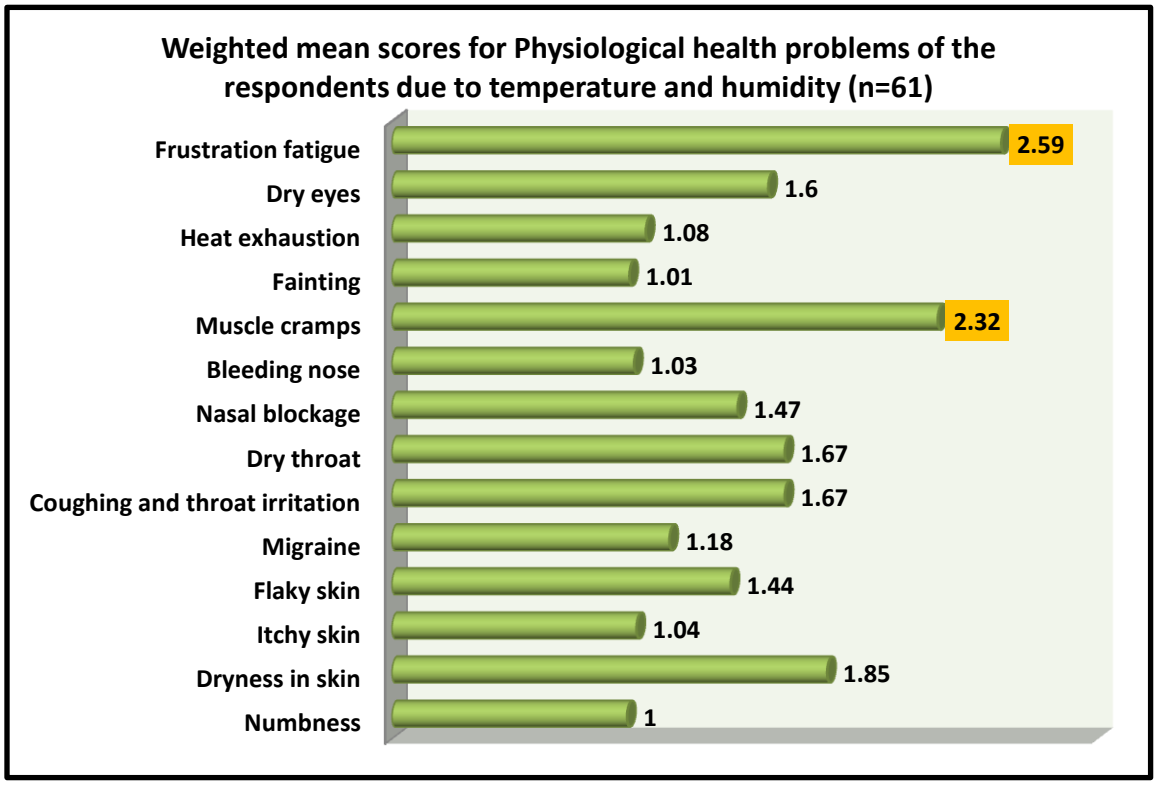



**Figure 17: Weighted mean scores for Physiological health problems experienced due to temperature and humidity at checkout counters**

**Psychological Health problems experienced due to Temperature and Humidity:** Less than two – third (60.65%) of the respondents experienced stress to high extent due to temperature and humidity at checkout counters. Less than two – third (60.65%) of the respondents faced difficulty in performing any tasks to some extent due to temperature and humidity (**Table 23, Fig. 18**). It was also found that more than one-half (52.45%) of the respondents experienced difficulty in concentration to low extent due to temperature and humidity at checkout counters. The mean weighted score were found high for psychological health problems such as stress (2.60), irritation (2.39) and frustration fatigue (2.31).

**Table 23: Frequency and percentage distribution of respondents according to extent of psychological health problems experienced due to temperature and humidity at checkout counters**

| Sr. No. | Psychological Health problems experienced due to Temperature and Humidity | Respondents (n=61) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | To High Extent | | To Some Extent | | To Low Extent | | Wt. mean Score (3 – 1) |
| | | f | % | f | % | f | % | |
| i. | Stress | 37 | 60.65 | 24 | 39.34 | 00 | 0.00 | 2.60 |
| ii. | Frustration fatigue | 24 | 39.34 | 32 | 52.45 | 05 | 8.19 | 2.31 |
| iii. | Irritation | 26 | 42.62 | 33 | 54.09 | 02 | 3.27 | 2.39 |
| iv. | Aggressive nature | 23 | 37.70 | 34 | 55.73 | 04 | 6.55 | 2.31 |
| v. | Difficulty in performing any tasks | 00 | 0.00 | 37 | 60.65 | 24 | 39.34 | 1.60 |
| vi. | Difficulty in concentration | 00 | 0.00 | 29 | 47.54 | 32 | 52.45 | 1.47 |
| | **Total** | | | | | | | **2.11** |

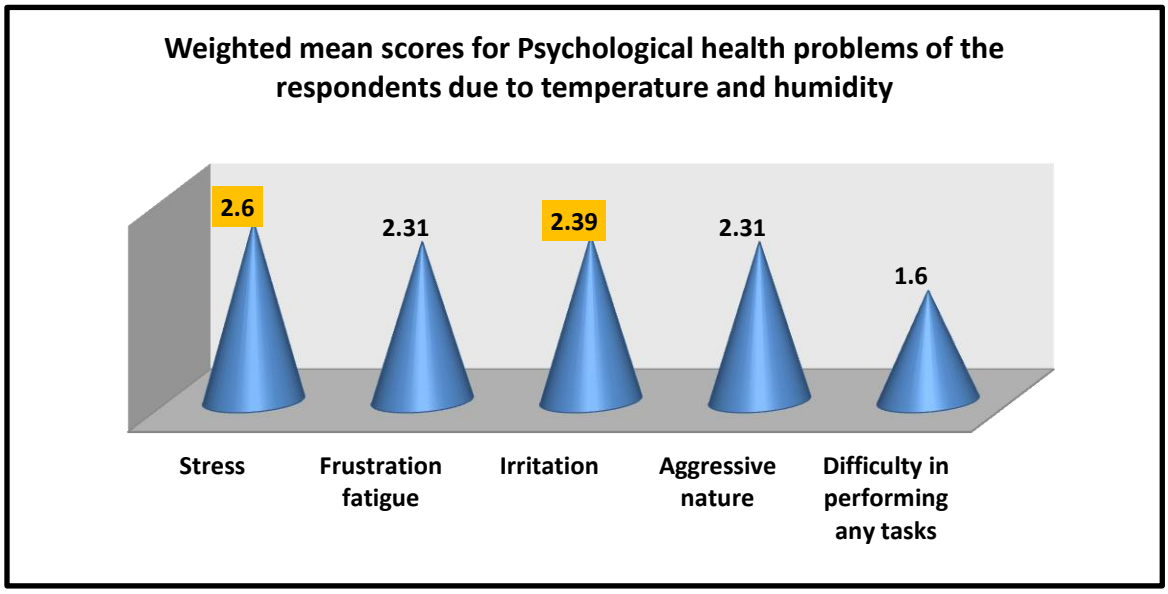



**Figure 18: Weighted mean scores for Psychological health problems experienced due to temperature and humidity**

### 4.2.4 Extent of Physiological and Psychological health problems experienced due to selected environmental Parameters

A probe was made to find out the extent of physiological and psychological health problems experienced due to selected environmental parameters at checkout counters viz. noise, illumination, temperature and humidity. The scores on each of the health problems were summated and possible range of minimum and maximum scores were divided into three categories having equal interval. The minimum score for physiological health problems experienced due to noise was 8 and maximum score was 24 and minimum score for psychological health problems experienced due to noise was 9 and maximum score was 27. The minimum score for physiological health problems experienced due to illumination was 7 and maximum score was 21 and minimum score for psychological health problems experienced due to illumination was 5 and maximum score was 15. The minimum score for physiological health problems experienced due to temperature and humidity was 14 and maximum score was 42 and minimum score for psychological health problems experienced due to temperature and humidity was 6 and maximum score was 18.

From **table 24**, it can be observed that more than one - half (52.45%) of the respondents faced low extent of physiological health problems experienced due to noise. Majority (86.88%) of the respondents faced psychological health problems to some extent due to noise at the checkout counters of selected retail stores. It was revealed that more than two-third (67.21%) of the respondents experienced physiological health problems experienced due to illumination to some extent. Little more than one - half (50.81%) of the respondents experienced psychological problems to some extent due to illumination at checkout counters. More than three – fourth (77.04%) of the respondents experienced physiological health problems to low extent due to temperature and humidity. Little more than three-fourth (75.40%) of the respondents experienced psychological health problems to some extent due to temperature and humidity of the selected retail stores.

**Table 24: Frequency and percentage distribution of respondents according to extent of physiological and psychological health problems experienced due to illumination, noise, temperature and humidity**

| Sr. No. | Health problems | Respondents (n=61) | | |
|---|---|---|---|---|
| | | Range score | f | % |
| **A.** | **Noise** | | | |
| **i.** | **Physiological Health Problems** | | | |
| | To low extent | 8-13 | 32 | 52.45 |
| | To some extent | 14-19 | 29 | 47.54 |
| | To high extent | 20-24 | 00 | 0.00 |
| **ii.** | **Psychological Health Problems** | | | |
| | To low extent | 9-15 | 06 | 9.83 |
| | To some extent | 16-22 | 53 | 86.88 |
| | To high extent | 23-27 | 02 | 3.27 |
| **B.** | **Illumination** | | | |
| **i.** | **Physiological Health Problems** | | | |
| | To low extent | 7-11 | 10 | 16.39 |
| | To some extent | 12-16 | 41 | 67.21 |
| | To high extent | 17-21 | 10 | 16.39 |
| **ii.** | **Psychological Health Problems** | | | |
| | To low extent | 5-8 | 03 | 4.91 |
| | To some extent | 9-12 | 31 | 50.81 |
| | To high extent | 13-15 | 27 | 44.26 |
| **C.** | **Temperature and Humidity** | | | |
| **i.** | **Physiological Health Problems** | | | |
| | To low extent | 14-23 | 47 | 77.04 |
| | To some extent | 24-33 | 14 | 22.95 |
| | To high extent | 34-42 | 00 | 0.00 |
| **ii.** | **Psychological Health Problems** | | | |
| | To low extent | 6-10 | 08 | 13.11 |
| | To some extent | 11-15 | 46 | 75.40 |
| | To high extent | 16-18 | 07 | 11.47 |

A probe was made to find out the overall physiological and psychological health problems of the cashiers of selected retail stores. On the same scale the physiological and psychological health problems experienced due to noise, illumination, temperature and humidity were totaled up separately. The minimum score for all the physiological health problems was 29 and maximum score was 87. The minimum score for all the psychological health problems was 18 and maximum score was 54. Minimum and maximum possible scores were divided

into three categories for the physiological and psychological health problems on the basis of equal interval which were “High Extent”, “Some Extent” and “Low Extent” of health problems.

**Table 25: Frequency and percentage distribution of respondents according to extent of physiological and psychological health problems experienced due to selected environmental parameters**

| Health problems | Respondents (n=61) | | |
|---|---|---|---|
| | Mean score | f | % |
| **Physiological Problems** | | | |
| To low extent | 29-48 | 29 | 47.54 |
| To some extent | 49-68 | 32 | 52.45 |
| To high extent | 69-87 | 00 | 0.00 |
| **Psychological problems** | | | |
| To low extent | 18-30 | 00 | 0.00 |
| To some extent | 31-43 | 29 | 47.54 |
| To high extent | 44-54 | 32 | 52.45 |

In **table 25,** the overall data revealed that more than one - half (52.45%) of the respondents experienced physiological health problems to some extent due to the selected environmental parameters viz. noise, illumination, temperature and humidity. More than one - half (52.45%) of the respondents had experienced high extent of psychological health problems experienced due to noise, illumination, temperature and humidity at checkout counters of selected retail stores.


**Plate 8: Recording responses of the cashiers regarding health problems**


**Plate 9: Recording responses of the cashiers regarding health problems**

### 4.3 Discomforts experienced by the cashiers at checkout counters

In order to find out the discomforts experienced by the cashiers, a standardized questionnaire i.e, Nordic Musculoskeletal questionnaire was used. The Nordic Musculoskeletal questionnaire includes questions relating to the neck, shoulder, upper back (cervical), elbows, low back (lumber), wrist/hands, hips, thighs, knees, ankles and feet. In this questionnaire respondents were asked if they have had any discomfort in the last 7 days and last 12 months. It was also asked that if the discomfort that had prevented them to carry out their normal activities i.e, job, household activities etc due to their discomforts during last 12 months. The body parts were presented here as upper body parts and lower body parts.

**Table 26: Frequency and percentage distribution of respondents according to discomforts experienced in their upper body parts during the last 12 months and 7 days**

| Sr. No. | Respondents (n=61) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Upper Body parts | Discomforts during last 12 months | | | | Discomforts during last 7 days | | | |
| | | Yes | | No | | Yes | | No | |
| | | f | % | f | % | f | % | f | % |
| i. | Neck | 16 | 26.22 | 45 | 73.77 | 15 | 24.59 | 46 | 75.40 |
| ii. | Right shoulder | 11 | 18.03 | 00 | 0.00 | 08 | 13.11 | 00 | 0.00 |
| | Left shoulder | 00 | 0.00 | 00 | 0.00 | 00 | 0.00 | 00 | 0.00 |
| | Both shoulder | 38 | 62.29 | 12 | 19.63 | 37 | 60.65 | 16 | 26.22 |
| iii. | Right elbow | 05 | 8.19 | 00 | 0.00 | 06 | 9.83 | 00 | 0.00 |
| | Left elbow | 00 | 0.00 | 00 | 0.00 | 00 | 0.00 | 00 | 0.00 |
| | Both elbow | 09 | 14.75 | 47 | 77.04 | 08 | 13.11 | 47 | 77.04 |
| iv. | Right wrists | 43 | 70.49 | 00 | 0.00 | 36 | 59.01 | 00 | 0.00 |
| | Left wrists | 00 | 0.00 | 00 | 0.00 | 00 | 0.00 | 00 | 0.00 |
| | Both wrists | 09 | 14.75 | 09 | 14.75 | 09 | 14.75 | 16 | 26.22 |
| v. | Right hand | 17 | 27.86 | 00 | 0.00 | 18 | 29.50 | 00 | 0.00 |
| | Left hand | 00 | 0.00 | 00 | 0.00 | 00 | 0.00 | 00 | 0.00 |
| | Both hands | 09 | 14.75 | 35 | 57.37 | 08 | 13.11 | 35 | 57.37 |
| vi. | Upper back (cervical) | 54 | 88.52 | 07 | 11.47 | 54 | 88.52 | 07 | 11.47 |

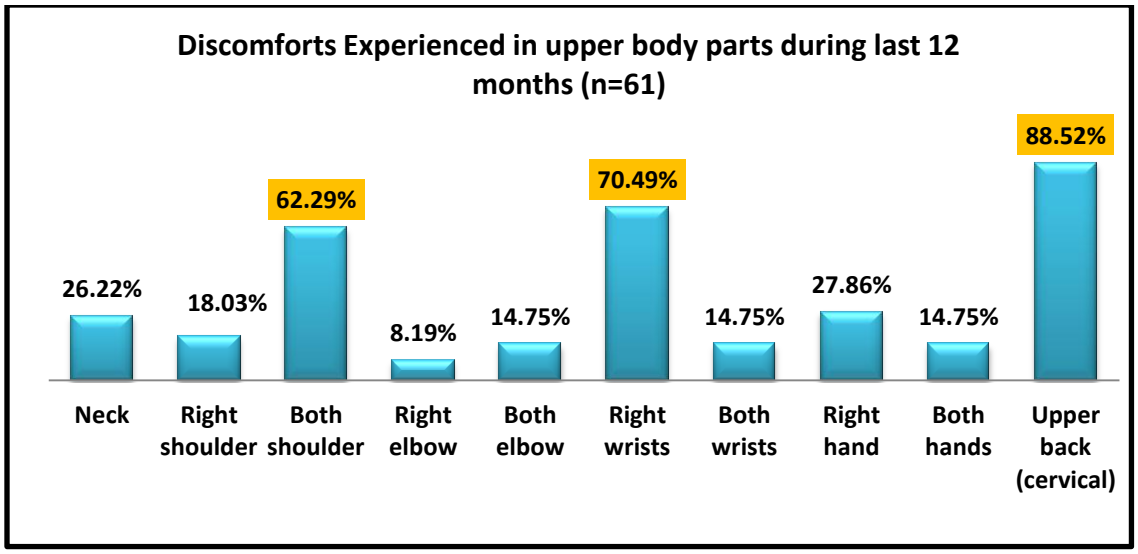



**Figure 19: Discomforts experienced in upper body parts during last 12 months**

The data in **table 26 and Fig. 19**, revealed that majority (88.52%) of the respondents experienced discomfort in their upper back (cervical) during last 12 months. Less than three-fourth (70.49%) of the respondents had encountered discomfort in their right wrist during last 12 months. It was also found that less than two - third (62.29%) of the respondents had discomfort in both shoulder during last 12 month.

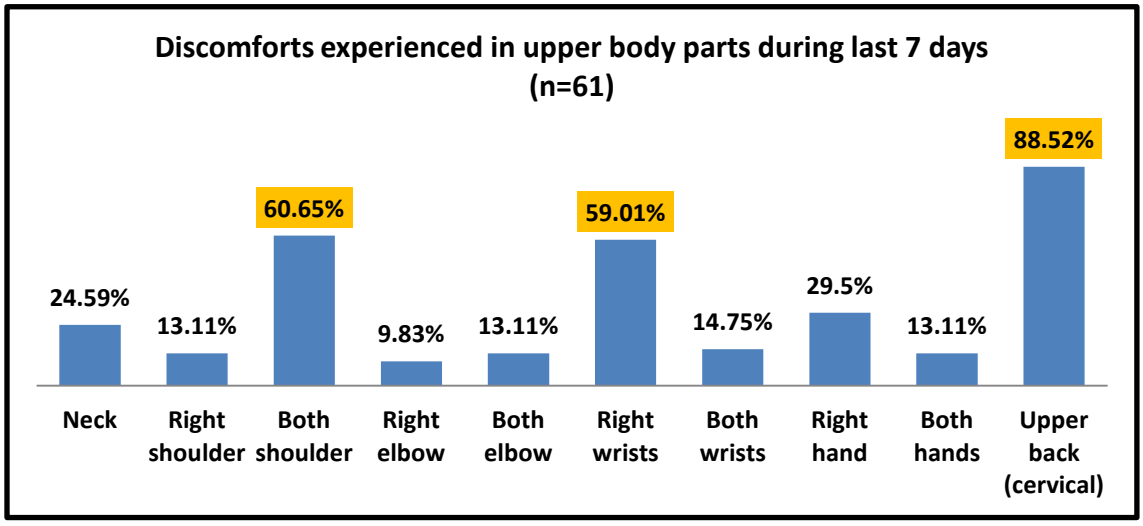



**Figure 20: Discomforts experienced in upper body parts during last 7 days**

From the **table 26 and Fig. 18**, it was found that since last 7 days, majority (88.52%) of the respondents experienced discomfort in their upper back (cervical). Less than two – third (60.65%) of the respondents experienced discomfort in their both shoulder. Moreover, 13.11 per cent of the respondents experienced discomfort in their right shoulder. More than one - half (59.01%) of the respondents experienced discomfort in their right wrist and 14.75 per cent of the respondents experienced discomfort in both the wrist.

**Table 27: Frequency and percentage distribution of respondents according to discomforts experienced in their lower body during the last 12 months and 7 days**

| Sr. No. | Respondents (n=61) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Lower Body parts | Discomforts during last 12 months | | | | Discomforts during last 7 days | | | |
| | | Yes | | No | | Yes | | No | |
| | | f | % | f | % | f | % | f | % |
| i. | Lower back (lumber) | 60 | 98.36 | 01 | 1.63 | 58 | 95.08 | 03 | 4.91 |
| ii. | Hips/buttocks (Both) | 34 | 55.73 | 27 | 44.26 | 32 | 52.45 | 29 | 47.54 |
| iii. | Thighs (Both) | 40 | 65.57 | 21 | 34.42 | 42 | 68.85 | 19 | 31.14 |
| iv. | Knees (Both) | 48 | 78.68 | 13 | 21.31 | 49 | 80.32 | 12 | 19.67 |
| v. | Ankles (Both) | 45 | 73.77 | 16 | 26.22 | 45 | 73.77 | 16 | 26.22 |
| vi. | Feet (Both) | 45 | 73.77 | 16 | 26.22 | 45 | 73.77 | 16 | 26.22 |

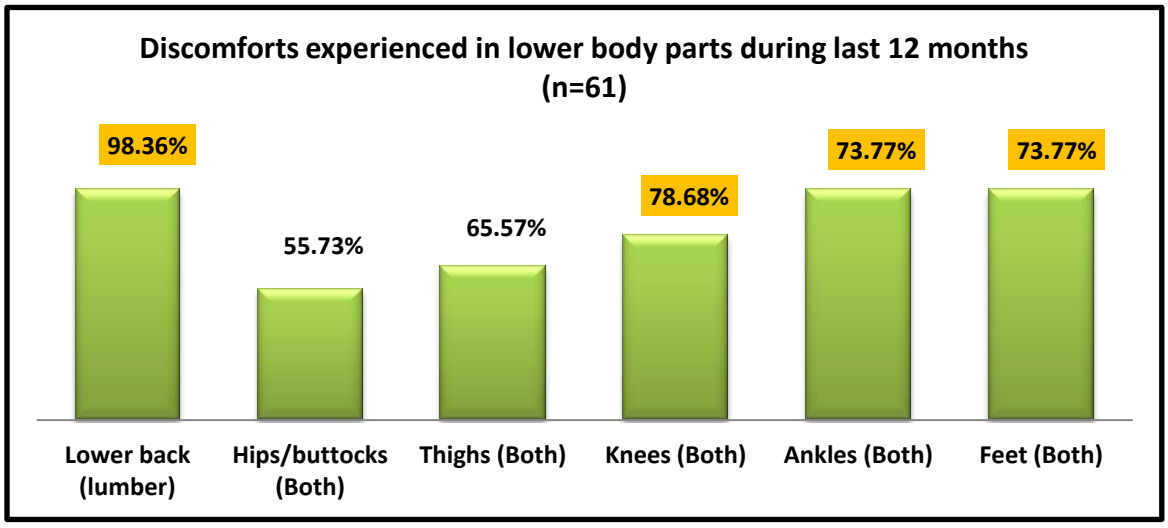



**Figure 21: Discomforts experienced in lower body parts during last 12 months**

**Table 27 and Fig. 21** revealed that majority (98.36%) of the respondents had experienced discomfort in their lower back (lumber) during last 12 months. More than three-fourth (78.68%) of the respondent had discomforts in their both knees during last 12 months. It was also found that less than three – fourth (73.77%) of the respondents experienced discomforts in their ankles and feet during last 12 months.

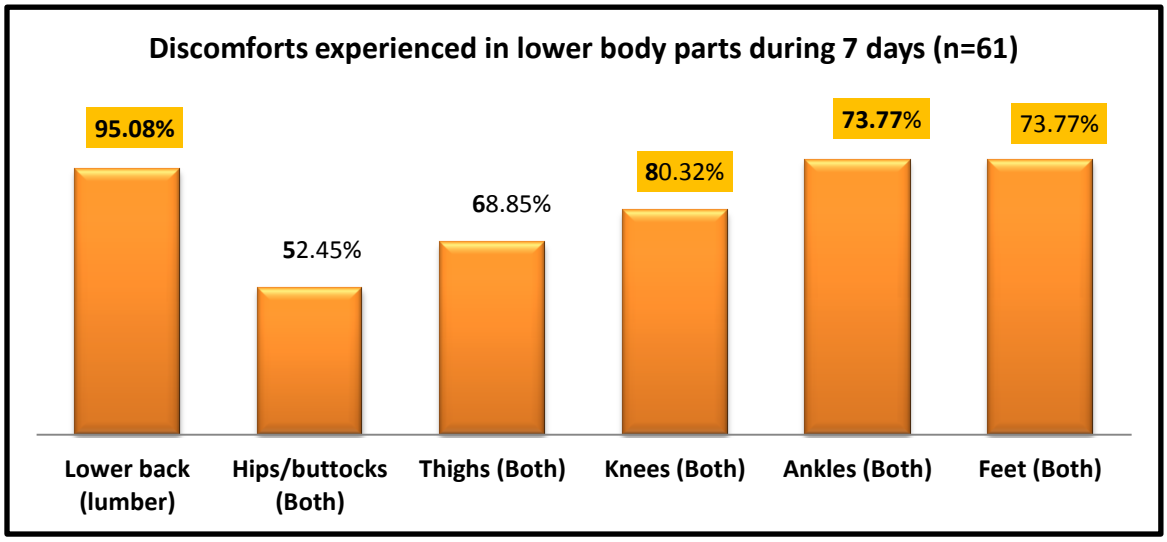



**Figure 22: Discomforts experienced in lower body parts during last 7 days**

The data in **Table 27 and Fig. 22** depicted that in lower body parts, majority (95.08%) of the respondents experienced discomfort in their lower back and knees (80.32%) during last 7 days. Less than three fourth (73.77%) of the respondents experienced discomfort in their ankles and feet during last 7 days.

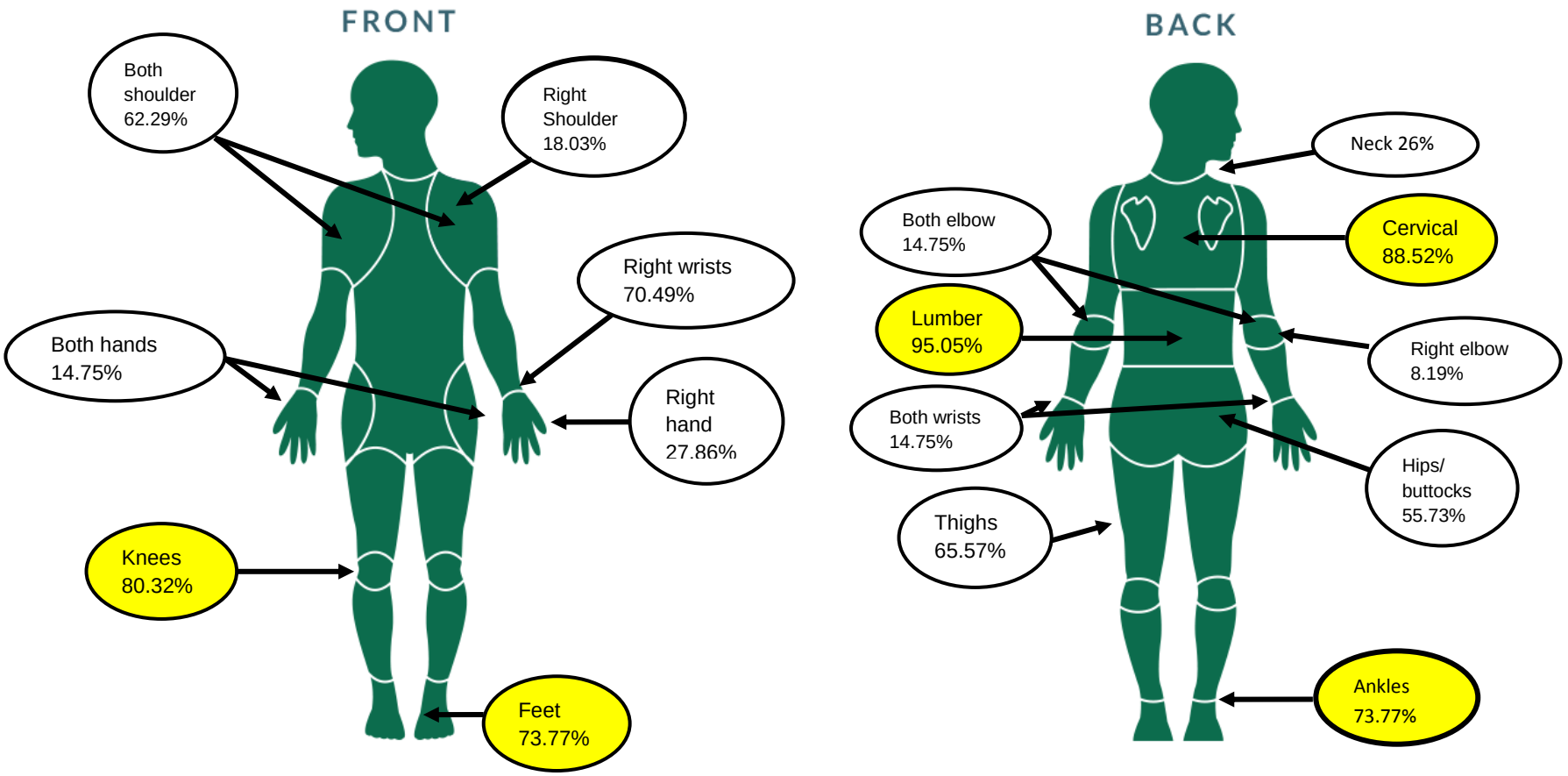



**Figure 23: Discomforts experienced in upper and lower body parts during last 12 months**

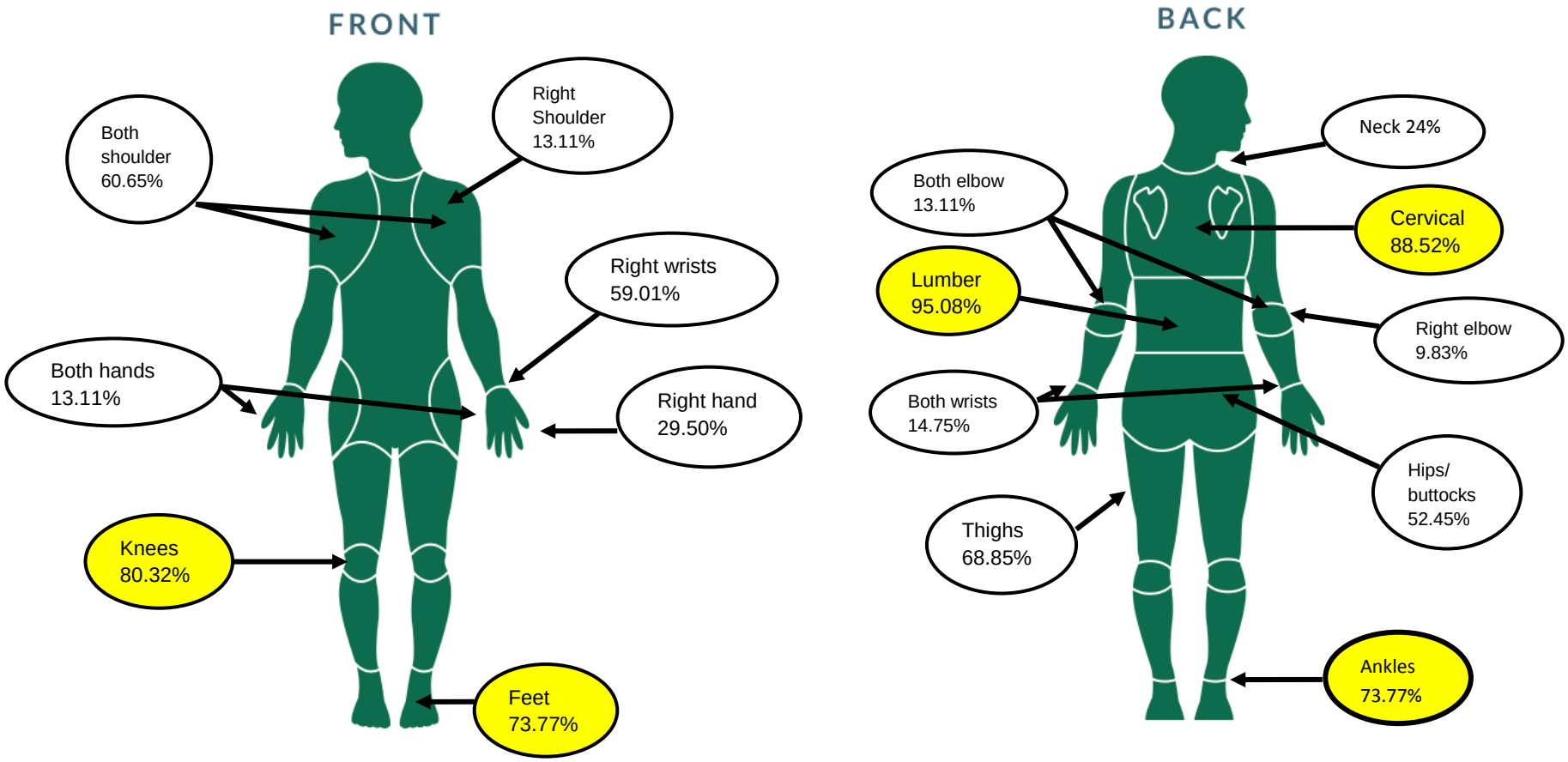



**Figure 24: Discomforts experienced in upper and lower body parts during last 7 days**

**Table 28: Frequency and percentage distribution of respondents according to discomforts in their upper body parts that prevented the cashiers from carrying out their normal activities during last 12 months**

| Sr. No. | Upper Body parts | Respondents (n=61) | | | |
|---|---|---|---|---|---|
| | | Yes | | No | |
| | | f | % | f | % |
| i. | Neck | 08 | 13.11 | 53 | 86.88 |
| ii. | Shoulders | 32 | 52.45 | 29 | 47.54 |
| iii. | Elbow | 07 | 11.47 | 54 | 88.52 |
| iv. | Wrists | 18 | 29.50 | 43 | 70.49 |
| v. | Hands | 18 | 29.50 | 43 | 70.49 |
| vi. | Upper back (cervical) | 39 | 63.93 | 22 | 36.06 |

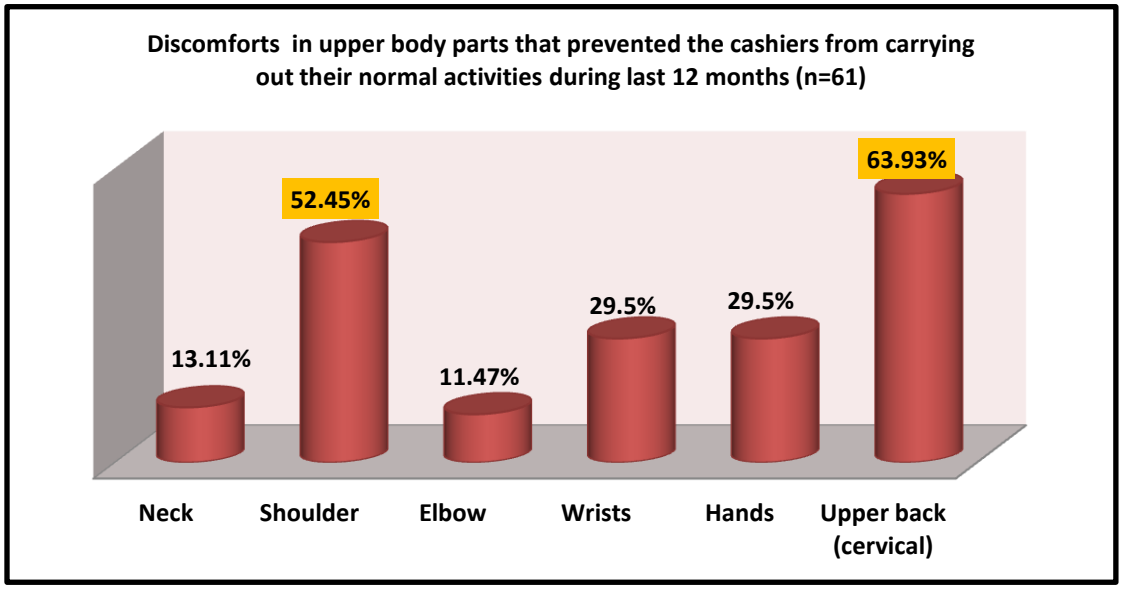



**Figure 25: Discomforts in upper body parts that prevented the cashiers from carrying out their normal activities during last 12 months**

It was revealed that less than two - third (63.93%) of the respondents experienced discomfort in their upper back during last 12 months which prevented them from carrying out their normal activities. More than one – half (52.45%) of the respondents experienced discomforts in their shoulder during 12 months which prevented them from carrying out their normal activities viz. household activities and other jobs (**Table 28 and Fig. 25**).

**Table 29: Frequency and percentage distribution of respondents according to discomforts in their lower body parts that prevented them from carrying out their normal activities during last 12 months**

| Sr. No. | Lower Body parts | Respondents (n=61) | | | |
|---|---|---|---|---|---|
| | | Yes | | No | |
| | | f | % | f | % |
| i. | Lower back (lumber) | 46 | 75.40 | 15 | 24.59 |
| ii. | Hips/buttocks | 27 | 44.26 | 34 | 55.73 |
| iii. | Thighs | 30 | 49.18 | 31 | 50.81 |
| iv. | Knees | 43 | 70.49 | 18 | 29.50 |
| v. | Ankles | 39 | 63.93 | 22 | 36.06 |
| vi. | Feet | 35 | 57.37 | 26 | 42.62 |

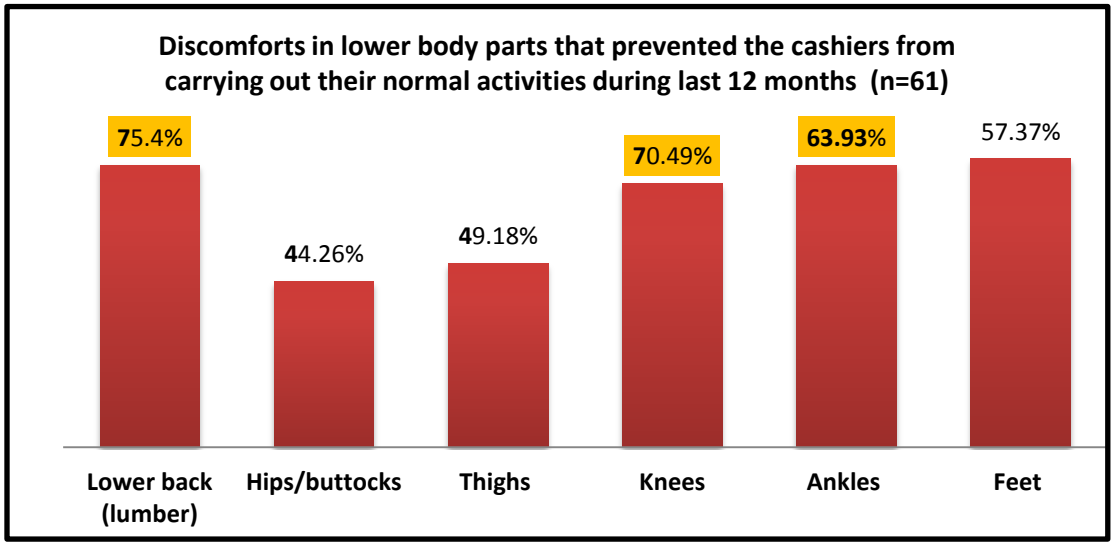



**Figure 26: Discomforts in lower body parts that prevented the cashiers from carrying out their normal activities during last 12 months**

Due to discomforts experienced in lower back (lumber) three-fourth (75.4%) of the respondents were prevented from carrying out their normal activities during last 12 months (Plate 10). It was also revealed that less than three – fourth (70.49%) of the respondents experienced discomforts in knees and two - third (63.93%) of the respondents experienced discomfort in their ankles during last 12 months which prevented them from carrying out their normal activities (**Table 29 and Fig. 26**).

**Plate 10: Recording responses of the cashiers regarding discomforts in their body parts**


**Plate 11: Cashiers working at checkout counters**

## Conclusion

The data were collected regarding personal and work related information of the respondents. The selected environmental parameters viz. noise, illumination, temperature and humidity of checkout counters were assessed of selected retail stores. The mean age of the respondents was 24.91 years. A little less than two – third (65.57%) of the respondents were in age group of 19 to 25 years. More than one – half (54.09%) of the respondents were males and less than one – half (45.9%) of the respondents were females. The mean height of the respondents was 162.51 cms. It was found that one – half (44.26%) of the respondents were of height ranging between 148 to 158 cms. The mean weight of the respondents was 51.91 kg and majority (80.33%) of the respondents had weight between 43 to 56 kg. Less than two – third (60.65%) of the respondents were unmarried. It was found that all the respondents of selected retail stores had 6 working days in a week and they were working 9 hours per day. On analyzing the data, it was observed that majority (81.96%) of the respondents had 1 to 2 breaks in a day and 18.03 per cent of the respondents had 3 to 4 breaks in a day. Majority (81.96%) of the respondents had one tea/coffee break in a day and 18.03 per cent of the respondents had two tea/coffee breaks in a day. Three-fourth (70.49%) of the respondents had one lunch break of 60 minutes in a day while more than one- fourth (29.50%) of the respondents had one lunch break of 30 minutes in a day. It was also found that all of the respondents reported that they did not had any musculoskeletal problems before joining as cashier at the present retail stores. Further, it was observed that all the selected retail stores had excess noise levels (decibels) than recommended level which was found more during evening shift. Majority of the stores had illumination above the recommended level i.e. 500 lux during all the three shifts viz. morning, afternoon and evening and a very few stores had illumination below the recommended level during the three shifts. The average temperatures of the stores were 26.82$^{o}$C during morning, 23.98$^{o}$C during afternoon and 23.93$^{o}$C during evening. The average humidity of the stores was found 57.81% during morning, 52.92% during afternoon and 55.19% during evening.

After analyzing overall data regarding health problems of cashiers, it was revealed that majority of the respondents experienced physiological health problems such as headache, increase muscular tension and tiredness and also psychological health problems such as stress, frustration fatigue and aggressive nature due to noise levels at the checkout counters. It was also found that majority of the respondents experienced physiological health problems viz. eyestrain and headache due to illumination. Psychological health problems experienced by them due to illumination were high for stress and frustration fatigue. Due to the temperature and humidity the respondents experienced muscle cramps and stress.

Moreover, it was found that majority of the respondents experienced discomfort in their lower back, upper back, knees, ankles and feet during last 12 months. It was also found that since last 7 days majority of the respondents experienced discomfort in their upper back (cervical), shoulders and lower back. Further, the respondents reported pain in upper back, lower back, knees, feet and ankles prevented them from carrying out their normal activities during last 12 months.

## 4.4 Testing of Hypotheses

Several hypotheses were formulated to find out the relationship between selected variables of the present study. In the present investigation, as per the nature of variables t-test, coefficient of correlation and Analysis of the Variance (ANOVA) were computed. For the purpose of statistical analysis, the hypotheses were formulated in null form. The results are presented in this section:

**$Ho_1$: There exists no relationship between extent of physiological and psychological health problems experienced by the cashiers due to selected environmental parameters and selected personal variables of the respondents**

This broad hypothesis was made into several specific hypotheses.

**$Ho_{1.1}$: There exists no variation in the extent of physiological and psychological health problems experienced by the cashiers due to environmental parameters viz. noise, illumination, temperature and humidity with selected personal variables viz. Age (in years) and Years of service as cashiers (in months)**

Analysis of Variance (ANOVA) was computed to test the hypothesis.

**Table 30: Analysis of Variance showing variation in the extent of physiological and psychological health problems experienced by the cashiers due to selected environmental parameters with selected personal variables viz. Age (in years), Years of service as cashiers (in months)**

| Sr. No. | Selected Variables | df | Sum of Squares | Mean Squares | F-value | Level of Significance |
|---|---|---|---|---|---|---|
| 1 | **Age (in years)** | | | | | |
| | Between groups | 2 | 384.074 | 192.037 | 1.851 | N.S* |
| | Within groups | 58 | 6018.713 | 103.771 | | |
| 2 | **Years of service as cashier (in months)** | | | | | |
| | Between groups | 2 | 72.225 | 36.113 | 0.331 | N.S* |
| | Within groups | 58 | 6330.561 | 109.148 | | |

***Notes: df = Degree of Freedom, *N.S= Not Significant***

The computation of F – value showed no significant variation in the extent of health problems experienced due to environmental parameters viz. noise, illumination, temperature and humidity with selected personal variable viz. age (in years) and years of service as cashier (in months). Hence, the null hypotheses were accepted **(Table 30)**.

**$Ho_{1.2}$: There exists no difference between extent of physiological and psychological health problems experienced by the cashiers due to environmental parameters viz. noise, illumination, temperature and humidity and Gender of the respondents**

To study the difference between extent of health problems experienced due to environmental parameters viz. noise, illumination, temperature and humidity and gender of the respondents, t-test was computed.

**Table 31: t-test showing difference in the extent of physiological and psychological health problems experienced by the cashiers due to environmental parameters viz. noise, illumination, temperature and humidity with Gender**

| Gender | Mean score | t-value | df | Level of significance |
|---|---|---|---|---|
| Male | 90.9394 | - 0.679 | 59 | N.S* |
| Female | 92.7500 | | | |

***Notes: df = Degree of Freedom, *N.S= Not Significant***

The computation of t-value depicted that there is no significant difference in the extent of health problems experienced due to environmental parameters viz. noise, illumination, temperature and humidity with gender. Hence, the null hypothesis was accepted **(Table 31)**.

**$Ho_2$: There exists no relationship between discomforts experienced by the cashiers during last 12 months and selected personal variables of the respondents**

This broad hypothesis was made into several specific hypotheses.

**$Ho_{2.1}$: There exists no variation in the discomforts experienced by the cashiers during last 12 month and selected personal variables of the respondents viz. Age (in years) and Years service as cashier**

Analysis of Variance (ANOVA) was computed to test the hypothesis.

**Table 32: Analysis of Variance showing variation in the discomforts experienced by the cashiers with selected personal variables viz. Age (in years) and Years of service as cashiers (in months)**

| Sr. No. | Selected Variables | df | Sum of Squares | Mean Squares | F-value | Level of Significance |
|---|---|---|---|---|---|---|
| 1. | Age (in years) | | | | | |
| | Between Groups | 2 | 154.533 | 77.267 | 5.474 | 0.01 |
| | Within Groups | 58 | 818.713 | 14.116 | | |
| 2. | Years of service as cashier | | | | | |
| | Between Groups | 2 | 42.649 | 21.325 | 1.329 | N.S* |
| | Within Groups | 58 | 930.596 | 16.045 | | |

***Notes: df = Degree of Freedom, *N.S= Not Significant***

The computation of F – value showed significant variation in the discomforts experienced by the cashiers with age (in years) of the respondents. The F – value was not found significant for years of service as cashier (in months) **(Table 32)**. Hence, the null hypothesis was partially accepted. Thus, it was inferred that the discomforts experienced by the cashiers varied with their age (in years).

**$Ho_{2.2}$: There exists no difference in the discomforts experienced by the cashiers during last 12 months with Gender**

To study the difference in the discomforts experienced by the cashiers with their gender, t-test was computed.

**Table 33: t-test showing difference in the discomforts experienced by the cashiers with Gender**

| Gender | Mean score | t-value | df | Level of significance |
|---|---|---|---|---|
| Male | 23.33 | - 0.331 | 59 | N.S* |
| Female | 23.68 | | | |

***Notes: df = Degree of Freedom, *N.S= Not Significant***

The computation of t-value depicted that there is no significant difference in the discomforts experienced by the cashiers with gender. Hence, the null hypothesis was accepted **(Table 33)**.

**$Ho_3$: There exists no relationship between the extent of health problems experienced due to noise and illumination and selected environmental parameters viz. noise and illumination at checkout counters**

Co-efficient of correlation was computed to find out relationship between the extent of health problems experienced due to the environmental parameters and noise and illumination at checkout counters.

**Table 34: Co-efficient of correlation showing relationship between the extent of health problems experienced due to noise and illumination and selected environmental parameters viz. noise and illumination in three shifts morning, afternoon and evening at checkout counters**

| Sr.no | Selected Variables | N | r-value | Level of significance |
|---|---|---|---|---|
| 1. | Extent of Health problems experienced due to Noise | | | |
| | Selected environmental parameter Noise | | | |
| | Morning Shift | 61 | 0.071 | N.S* |
| | Afternoon Shift | | - 0.320 | N.S* |
| | Evening Shift | | - 0.324 | N.S* |
| 2. | Extent of Health problems experienced due to Illumination | | | |
| | Selected Environmental parameter Illumination | | | |
| | Morning shift | 61 | - 0.703 | 0.01 |
| | Afternoon Shift | | - 0.670 | 0.01 |
| | Evening Shift | | - 0.699 | 0.01 |

***Notes: *N.S= Not Significant***

The computation of Co-efficient of Correlation was not found significant for extent of health problems experienced due to noise with noise level at the checkout counters during morning, afternoon and evening. The Co-efficient of Correlation was found significant for extent of health problems experienced due to illumination with illumination level at the checkout counters during morning, afternoon and evening. Hence, the null hypothesis was rejected. Since, the correlation values are found negative, therefore, it is inferred that low illumination level at checkout counters causes high extent of physiological and psychological health problems **(Table 34)**

**$Ho_4$: There exists no relationship between the discomforts experienced by the cashiers during last 12 months and discomforts that prevented them from carrying out their normal activities during last 12 months**

Co-efficient of correlation was computed to find out relationship between the discomforts experienced by the cashiers during last 12 months and discomforts that prevented them from carrying out their normal activities during last 12 months.

**Table 35: Co-efficient of correlation showing relationship between the discomforts experienced by the cashiers during last 12 months and discomforts that prevented them from carrying out their normal activities during last 12 months**

| Selected Variables | n | r-value | Level of significance |
|---|---|---|---|
| Discomforts experienced by the cashiers during last 12 months | 61 | 0.764 | 0.01 |
| Discomforts that prevented them from carrying out their normal activities during last 12 months | | | |

The results revealed that their existed significant relationship between the discomforts experienced by the cashiers during last 12 months and discomforts that prevented them from carrying out their normal activities during last 12 months. Hence, the null hypothesis was rejected **(Table 35)**. It can be concluded

that more is the discomforts experienced by the cashiers during last 12 months more was they were prevented them from carrying out their normal activities during last 12 months.

## Conclusion

A significant relationship was found between the discomforts experienced by the cashiers during last 12 months and age. It signifies that discomforts experienced by the cashiers during last 12 months varied with age of the cashiers. The values were found significant in age group 26-32 and 33-39. Therefore, it can be concluded that as the age of respondents increases the discomforts also increase. A significant relationship was found between the extent of health problems experienced due to illumination and illumination level at the checkout counters of the selected retail stores during morning, afternoon and evening. Since, the correlation values are found negative, therefore, it is inferred that low illumination level at checkout counters causes high extent of physiological and psychological health problems. A significant relationship was found between the discomforts experienced by the cashiers during last 12 months and discomforts that prevented them from carrying out their normal activities during last 12 months. Therefore, it can be concluded that as the discomforts experienced by the cashiers during last 12 months act as hindrance for carrying out their normal activities during last 12 months.

## 4.5 Ergonomic Tips for Reducing Discomforts and Improving Environmental Parameters of Cashiers

Retail stores provide a vital service to the public. The role of cashiers is very significant as they are the person who makes these retail stores alive. From the present study it was found that they experienced some musculoskeletal discomforts while working. These discomforts lead them to some musculoskeletal disorders such as back injuries, muscle strain, carpal tunnel syndrome, rotator cuff injuries (a shoulder problem) and many more if continued further. One of the objectives of the present study was to suggest ergonomic tips for reducing discomforts and to improve the selected environmental parameters, which will be helpful for them to perform their work efficiently. Therefore, there is a need to suggest ergonomic tips for reducing discomforts and the environmental parameters which will help them to increase their productivity and reduces absenteeism.

### Ergonomic Tips for Reducing Discomforts

Occupational Safety and Health Administration (OSHA) (2004) provided practical recommendations to help retail store cashiers to reduce the musculoskeletal discomforts in their workplaces. This can be done by recommending correct working postures.

i. **Recommended Working Postures:** According to Occupational Safety and Health Administration (OSHA), recommended Working Postures describe body positions that are neutral and comfortable to use. Using postures other than those recommended will generally waste energy and motion as well as potentially raise the risk of injury. Changing position frequently and stretch between tasks helps in improving circulation and lessens fatigue.

ii. **Best and Preferred Work Zone:** Performing work within the best and preferred work zones facilitates productivity and comfort. Work is safest when lifting and reaching is performed in these zones. Working outside these

work zones results in non-neutral postures that may increase the risk of injury. It is particularly important to perform heavy lifting tasks within the best work zone **(Fig. 27).**

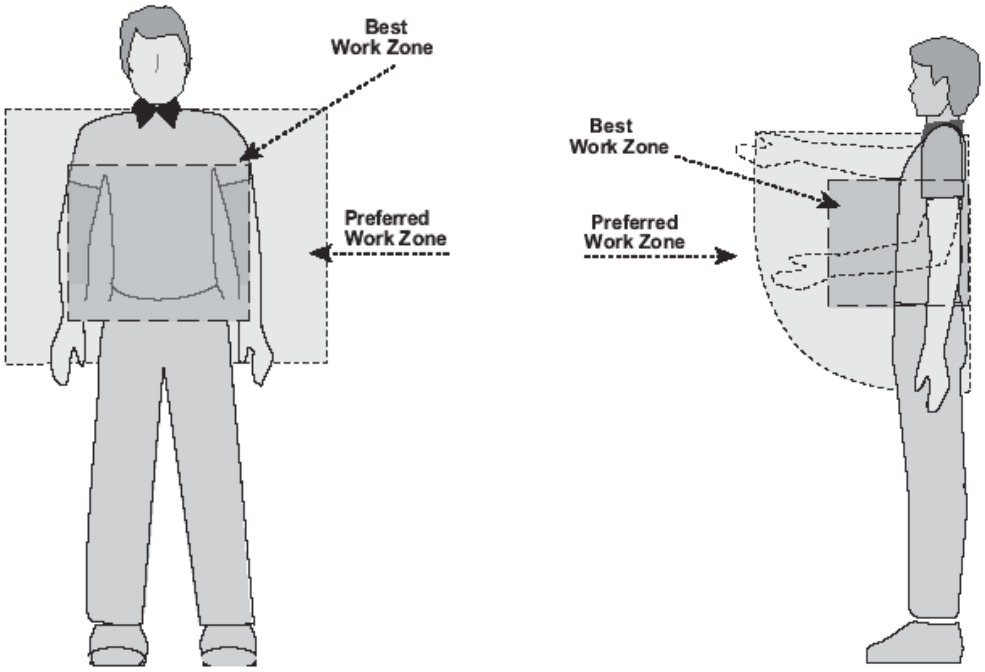



**Figure 27: Best and preferred work zone**

iii. **Checkout and Bagging:** Checking out and bagging were the regular tasks of the cashiers. They have to perform these tasks for every customers visited to the retail stores. Thus, they were subjected to awkward postures and repetitive which as a result developed musculoskeletal discomforts among the cashiers. Given below are some ergonomic tips given by Occupational Safety and Health Administration (2004) to cope with these problems.

- A powered in-feed conveyor should be used to help cashiers bring the items to their best work zone, rather than leaning and reaching to get items further up the conveyor **(Fig. 28).**

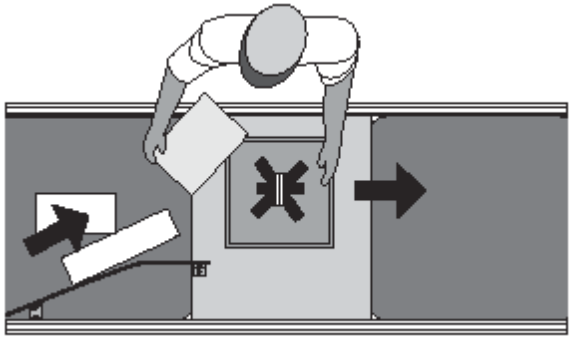


**Figure 28: Cashier working at Best work zone**

- In-feed and take-away conveyor belts should be placed as close as possible to the cashier to minimize reaching.

- Work should be performed within the preferred work zone **(Fig. 29).**

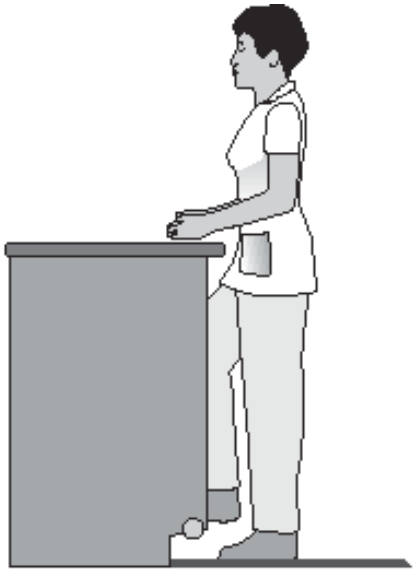


**Figure 29: Cashier working at preferred work zone**

- Keyboards should be considered to enter the quantity of identical products rather than scanning each individual item **(Fig. 30).**

**Figure 30: Cashier using keyboard to enter items**

- Keyboards should be used to enter code if item fails to scan after second attempt.

- Keyboards should be placed on supports that adjust in height, horizontal distance and tilt to keep work within the preferred work zone.

- Cash register displays should be placed at or slightly below eye level.

- Scan cards or scan guns should be used for large or bulky items to eliminate the need to handle them.

- Scanners and conveyors should be set at the same height so that cashiers can slide items across rather than lift them **(Fig. 31).**

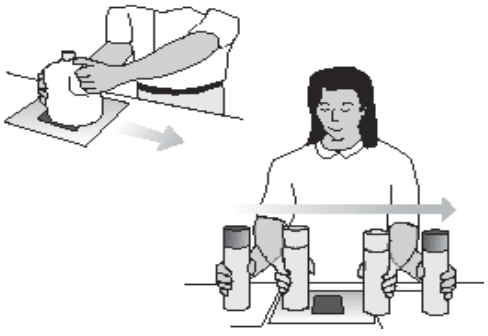


**Figure 31: Sliding items across the scanner**

- Cashiers should wear suitable and supportive shoes. The shoes shall be able to maintain the shape of the foot and provide support for the arch of the foot; have adequate space to allow movement of toes; have shock-absorbing insoles, and have low heels (not higher that 5 cm or 2 inches). Suitable shoes can reduce the health risks of standing **(Fig.32).**

**Figure 32: Suitable shoes [10]**

- Standing on anti-fatigue mats, as compared to bare floors, provides a noticeable improvement in comfort. It reduces back pain and stress when standing for long period of time, prevents from injury and fatigue and also reduces foot pressure. When cashiers works by standing for longer period of time, certain body parts are going to become stiff such joints, especially knees are the most at risk of experiencing this minor annoyance which can lead to major. The anti-fatigue mat prevents from such stiffness. It also promotes good postures **(Fig. 33)**. The rubbery and cushioned surface will keep the cashier balanced and relaxed even when they are not moving. This way, the blood flow of the body is not disrupted, promoting good posture in the process. Anti-fatigue mat also eliminate fatigue while working for long hours. This leads to a substantial reduction of stress. (CCOHS, 2015).

**Figure 33: Anti fatigue mat [11]**

- The cashiers should encourage to perform appropriate stretching exercises to relax their legs during work breaks.

iv. **Some tips to relax body**

The cashiers can perform some stretching exercise during their break times to relax their body. The cashiers should be relaxed while performing the exercises. The exercises should not be done in a hasty manner. Following are some of the stretching exercises as suggested by Canadian Centre for Occupational Health and Safety (CCOHS), 2020 for retail store cashiers.

- **Shoulder Shrugs:** Raise shoulder towards ears. Hold and relax downward to a normal position **(Fig. 34)**

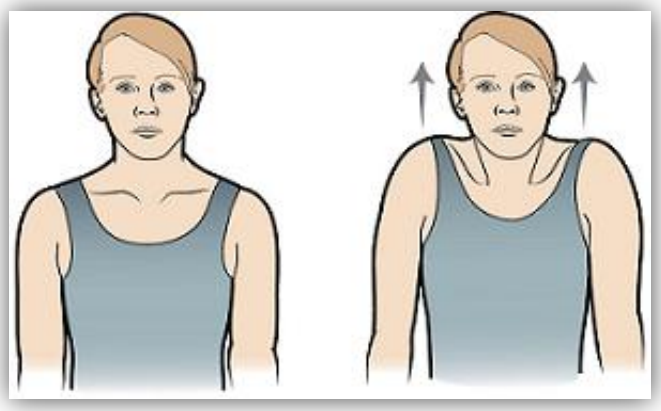


**Figure 34: Shoulder Shrugs [12]**

- **Neck Tilts:** Keep shoulders relaxed and arms hanging loosely. Tilt head sideways, first to one side, then the other. Hold 5 seconds each side. **(Fig. 35)**

**Figure 35: Neck Tilts[13]**

- **Wrist/Forearm Stretch:** Place hands palm to plam. Rotate palms around until they face downward keeping elbow even. Hold 5-8 seconds. **(Fig. 36)**


**Figure 36: Wrist/Forearm Stretch [14]**

- **Back and Hip Stretch:** Bend left leg over right leg and look over left shoulder. Place right hand on left thigh and apply pressure. Repeat for right side **(Fig. 37).** The cashiers can perform this exercise during there break times.

**Figure 37: Back and Hip Stretch [15]**

- **Upper Body Stretch:** Interlace fingers, turn palms upward and straighten arms above head. Elongate arms to stretch through upper sides of your rib cage. Hold 10-15 seconds. Breathe deeply **(Fig. 38).**

**Figure 38: Upper Body Stretch [16]**

- **Hamstring Stretch:** Sit and hold onto upper left leg just above and behind the knee. Gently pull bent knee toward chest. Hold 15-20 seconds. Repeat on right leg **(Fig. 39).** This can be done at their break hours.

**Figure 39: Hamstring Stretch** [17]

- **Upper Back Stretch:** Interlace fingers behind head with elbows out. Pull shoulder blades together. Hold 5 seconds, then relax **(Fig. 40).**

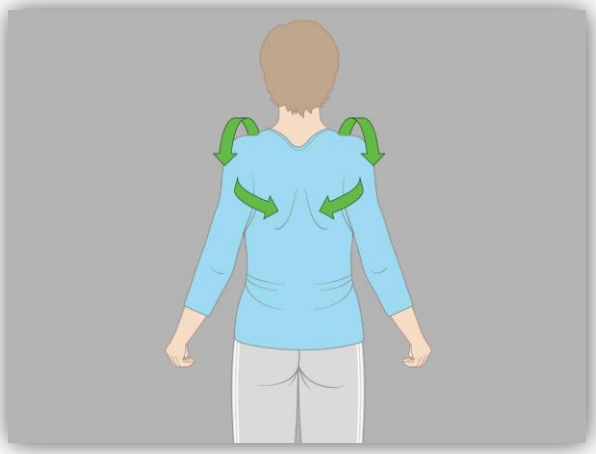


**Figure 40: Upper Back Stretch** [18]

- **Hand/Finger Stretch:** Separate and straighten fingers. Hold 10 seconds. Bend fingers at knuckle and hold 10 seconds. Separate and Straighten again **(Fig. 41).**

**Figure 41: Hand/Finger Stretch [19]**

- **Back Stretch:** Lean Forward. Keep head down and neck relaxed. Hold 10-20 seconds. Use hands to push yourself back and up **(Fig. 42).** The cashiers can perform these exercise during their breaks.

**Figure 42: Back Stretch [20]**

- **Side Stretch:** Hold left hand with right hand. Gently pull your elbow behind your head to feel stretch in shoulder or back of upper arm. Hold 10 seconds. Don't overstretch or hold breath. Repeat on right side **(Fig. 43).**

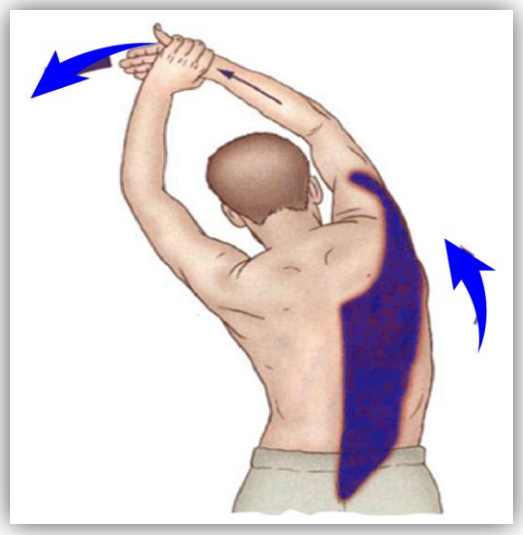


**Figure 43: Side Stretch** [21]

**According to Occupational Safety and Health Branch Labour Department (2018),**

**Figure 44: suggestions for seated checkout counters**

**Adjustable backrest height gives effective support to the back**

**The seat pan is padded and free from sharp edges**

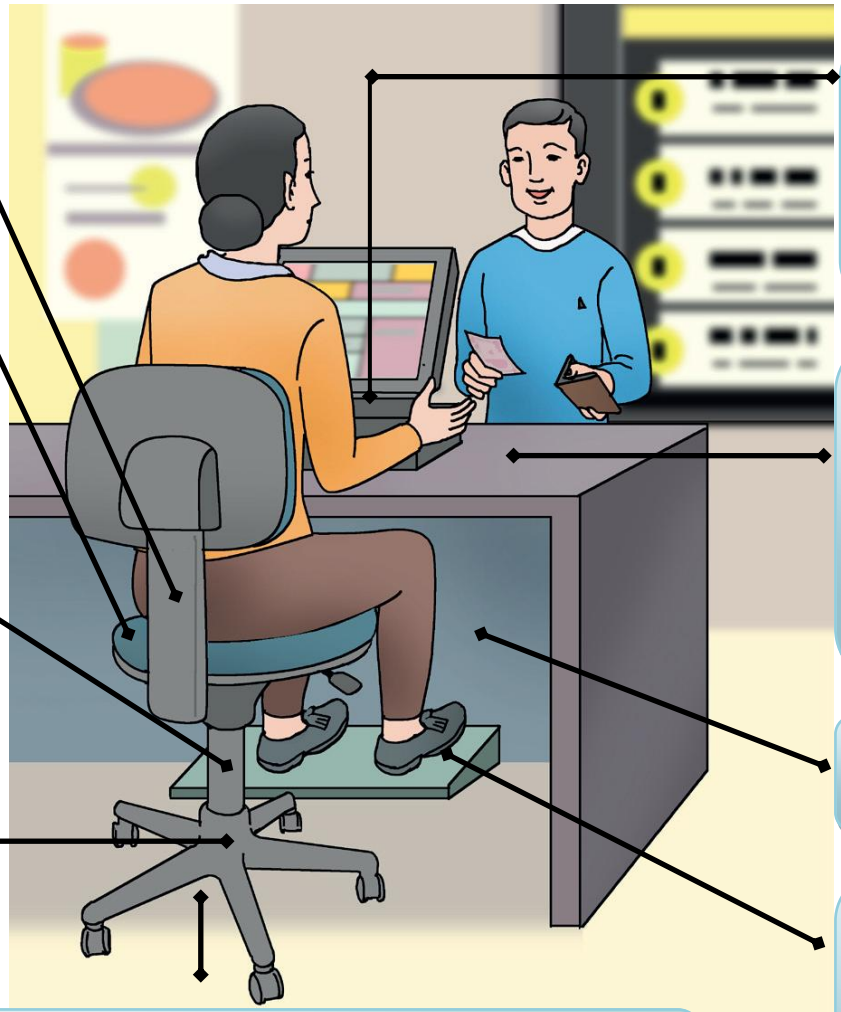
**Seat height should be adjustable so as to cater for different users**

· When the cashier is seated, his/her feet shall be firmly placed on the floor or on the footrest.

· Enable most of the work to be done at or slightly below elbow level.

**Stable seat base**

- If the work requires the body to change direction frequently, the chair should be of swivel type



**Position frequently used equipment within easy reach**

- Reduce the need for overstretching and stooping of the body

**Counter height at or slightly below elbow level**

- The cashiers can rest elbows and move arms freely above the work surface while the shoulders are relaxed

**Adequate leg room under the counter**

**Footrest (if needed) should be stable, of appropriate size and with non-slippery surface**

· Provide a footrest if the cashier's feet cannot be placed flat on the floor.

**Adequate space behind the chair**

· The employee can move and stand up freely.

**Figure 45: Suggestions for standing checkout counters**

**Position frequently used equipment within easy reach**

- Reduce the need for overstretching and stooping of the body

**Counter height should be set between elbow and hip level**

**Adequate leg room under the counter**

- Enable the cashiers to raise the leg and place the foot on the foot rail or the foot rest and keep the body close to the counter

**Provide a chair, so far as reasonably practicable, for the cashier to sit down when the working condition permits**

The chair shall be of suitable height so that the cashier can place his/her feet flat on the floor. Otherwise, a suitable foot rest shall be provided

**Install a resilient floor or place a shock absorbent mat**

- Mats must not cause any tripping or falling hazard

**Install a foot-rail or foot rest**

- Enable the cashiers to raise either leg alternately on the devise to relieve fatigue while standing at work

## I. Tips for Improving Environmental Parameters of Checkout Counters

Illumination at work place also plays a very important role in improving the efficiency, safety and health of workers. It is said that workplace illumination is among the important parameters influencing worker's productivity in terms of speed, quality of work, downtime, absenteeism and accident rates. As illumination, noise, temperature and humidity are important environmental parameters of indoor workplace, therefore the workplace of the cashier's i.e the checkout counters should have proper environment to make the work of the cashiers efficient. From the present study it was found that cashiers face many physiological and psychological health problems experienced due to the selected environmental parameters especially illumination. Here, are some tips to improve the selected environmental parameters at the checkout counters.

### Illumination at checkout counters

The recommended amount of illumination levels acceptable for retail stores as given by Chauhan (2016) was 500 lux. According to Health and Safety Executive (HSE) (1997) and California Lighting Technology Center, UC Davis (2013), there are many simple measures that can be taken to eliminate or reduce health and safety risks from illumination.

**Problem:** Insufficient illumination on the task

**Solution**

- Clean lamps and luminaries.
- Increase reflectance of room surfaces, for example change décor to light colours.
- Remove obstructions.
- Decrease spacing of luminaries or provide more fittings.
- Provide local luminaries or move the working area where there is proper illumination.

**Problem:** Uneven illumination

**Solution**

- Provide additional luminaries.
- Decrease spacing between luminaries.
- Change luminaries to give wider illumination distribution and more upward light without causing glare.
- Increase the reflectance of room surfaces.
- Remove any obstructions.

**Problem:** Luminaries too bright

**Solution**

- If linear luminaries are used, change the orientation to provide an end-on-view.
- Raise height of laminaire, if the reduction in luminance is acceptable.
- Increase reflectance of room surfaces against which luminaries are seen.

**Problem:** Strong shadows on the task

**Solution**

- Change the luminaries or their spacing to provide a more even illuminance.
- Increase number of luminaries.
- Provide local or task illumination.

**Problem:** Natural light seen through windows or roof lights too bright

**Solution**

- Fit blinds to windows.
- Ensure that the walls and ceiling areas surrounding the windows and roof lights have a high reflectance.
- Rearrange work to avoid looking towards windows/ roof lights.

Illumination can also be improved by the orientation of the checkout counters thinking about how daylight entering the interiors changes throughout the day and the seasons.

**Temperature and Humidity at the Checkout counters**

According to Occupational Safety and Health Administration (OSHA), it has no regulations specifically addressing temperature and humidity. However, Occupational Safety and Health Administration (OSHA) provides engineering and administrative guidance to prevent or alleviate indoor air quality problems. Air treatment is defined under the engineering recommendations as the removal of air contaminants and /or the control of room temperature and humidity. Occupational Safety and Health Administration (OSHA) recommends temperature control in the range of 68 – 76$^{o}$F and humidity control in the range of 20% - 60%. Additionally, Occupational Safety and Health Administration (OSHA) addresses that office temperature and humidity conditions are generally a matter of human comfort rather that hazards that could cause death or serious physical harm. Also, according to American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) addresses that employee wearing a normal amount of clothing feels neither too cold nor too warm.[25] Therefore, the cashiers can be suggested to wear clothes according to their feeling of warmth or cool at the checkout counters.

# *Summary and Conclusion*

# CHAPTER – V

## SUMMARY, CONCLUSION AND RECOMMENDATIONS

The retail sector in India is emerging as one of the largest sectors in the economy. The retail industry employs a huge share of the total workforce in India. There are several types of workers who are involved in these retail stores to function them smoothly. Among the workers, cashiers are the one who plays a vital role in the retail stores. The cashiers perform several functions such as scanning and billing of the products purchased by the customers and bagging the products purchased by them. The environmental parameters such as noise, illumination, temperature and humidity of the checkout counters of the retail store play an important role in their productivity. Lacking proper work environment such as noise, illumination, temperature and humidity, cashiers may develop several physiological and psychological health problems which would negatively affect their productivity. They may develop physiological health problems such as headaches, drowsiness, increase muscular tension, blurred vision, burning of eyes, dry eyes, dry skin, nasal blockage, bleeding nose, dry throat, ringing of ears, muscle cramp, frustration fatigue and also psychological health problems such as stress, irritation, aggressive nature and hindrance in conversation. The cashiers worked for about 9 hours a day in a standing position during their entire shift. They are also subjected to repetitive tasks and awkward postures which may cause musculoskeletal discomforts in their body parts which leads to musculoskeletal disorders. This may consequently increase absenteeism and cause low productivity. Therefore, it is very important to provide a workplace to the cashiers which would help them to work efficiently. Hence, the present study was undertaken to assess the selected environmental parameters viz. noise, illumination, temperature and humidity of checkout counters of the selected retail stores. These were assessed through noise meter, lux meter and thermo-hygro meter and were recorded in record sheet. The physiological and psychological health problems and the discomforts experienced by the cashiers of the selected retail stores were also assessed which helped in suggesting ergonomic tips for

reducing discomfort and improving environmental parameters of the cashiers of selected retail stores.

Studies found while collecting Review of Literature focused on designing of checkout counters of retail stores, assessing the body postures and assessing the discomforts experienced by the cashiers. Studies related to assessing the environmental parameters such as noise, illumination, temperature and humidity were hard to find. A dearth of researches was found regarding physiological and psychological health problems experienced due to environmental parameters such as noise, illumination, temperature and humidity of the cashiers of retail stores.

Courses such as “Ergonomics” and “Consumer Ergonomics” are among the thrust areas of the field of Family and Community Resource Management. Hence, the information gathered through the present study would widen the data base. The finding may be helpful in designing checkout counters of retail stores. Moreover, the findings will also help the students to gain insight into the area of ergonomics on physiological and psychological health problems caused by the environmental parameters viz. noise, illumination, temperature and humidity.

**Statement of the problem**

The present research study aims to assess the environmental parameters of the checkout counters of the cashiers, to find out the extent of physiological and psychological health problems and extent of discomforts experienced by the cashiers of selected retail stores.

**Objectives of the study**

1. To assess the environmental parameters of the checkout counters of selected retail stores.
2. To find out the extent of physiological and psychological health problems experienced by cashiers of selected retail stores due to selected

environmental parameters of checkout counters of selected retail stores viz. noise, illumination, temperature and humidity.

3. To assess the extent of discomfort experienced by the cashiers of selected retail stores.
4. To suggest ergonomic tips for
   c) Reducing discomfort.
   d) Improving environmental parameters of the cashiers.

**Delimitation**

The study was limited to those cashiers who had worked as cashiers in the retail stores for minimum 12 months.

**Hypotheses of the study**

1. There exists a relationship between extent of physiological and psychological health problems experienced by the cashiers due to selected environmental parameters with selected personal variables of the respondents.
2. There exists a relationship between discomforts experienced by the cashiers during last 12 months with selected personal variables of the respondents.
3. There exists a relationship between the extent of health problems experienced due to noise and illumination and selected environmental parameters viz. noise and illumination.
4. There exists a relationship between the discomforts experienced by the cashiers during last 12 months and discomforts that prevented them from carrying out their normal activities during last 12 months.

**Methodology**

The research design for the present investigation was descriptive in nature. The samples for the present study was selected from nine different retail stores of Vadodara city. These retail stores were selected through convenience sampling

technique. The data were collected from 61 respondents who were working as a cashier for minimum 12 months in the selected retail stores of Vadodara city. Therefore, purposive sampling technique was used for selecting the respondents from the retail stores. For the present study two data collection tools were developed namely interview schedule and record sheet.

**Interview Schedule** was developed to collected data from the cashiers of the selected retail stores. Apart from background information, it comprised of two sections “Extent of health problems experienced due to environmental parameters” and “Discomforts experienced by the cashiers”. The section “Extent of health problems experienced due to environmental parameters” comprised of a summated scale of Likert type showing health problems experienced due to selected environmental parameters. It included list of physiological and psychological health problems that can be caused due to noise, illumination, temperature and humidity. It had 3 point continuum for the responses “to high extent”, “to some extent” and “to low extent” which were scored 3 through 1 respectively. High scores reflected high extent of health problems. In section “Discomforts experienced by the cashiers” a standardized questionnaire namely “Nordic Questionnaire” was used to find out the discomforts experienced by the cashiers while performing their tasks during last 12 months and during last 7 days. It was also focused on finding out if the discomforts experienced had prevented them from carrying out their normal activities during last 12 months. This were asked for different body parts viz. neck, shoulder, wrists, elbow, upper back, lower back, buttocks, thighs, hips, knees, ankles and feet.

**Record Sheet** was prepared to assess the environmental parameters viz. noise, illumination, temperature and humidity of the checkout counters of the selected retail stores. It had columns to record the noise, illumination, temperature and humidity levels which were measured through sound level meter, lux meter and thermo hygro meter. The readings of noise, illumination, temperature and humidity were recorded for three different shifts viz. morning (9:30-10:30am), afternoon (1:30-2:30pm) and evening (5:30-6:30pm).

Validity and reliability was established for the scale Extent of health problems experienced by the cashiers due to selected environmental parameters prepared by the researcher. To test the content validity of the scale it was given to panel of three judges from Department of Family and Community Resource Management, Faculty of Family and Community Science, The Maharaja Sayajirao University of Baroda, Vadodara and two experts from Shreemati Nathibai Damodar Thackersey Women's University, Mumbai. The reliability of the scale was established through split-half methods of establishing reliability. The Cronbach's alpha test has been applied on random 30 sample size. The reliability value found was 0.906 for the scale which reflects the high reliability of the tool. The data were analysed using descriptive statistics (Frequency, percentage and mean) and relational statistics i.e. Analysis of Variance (ANOVA), "t" test and Co-efficient of Correlation were applied according to the nature of the variables.

**Major Findings**

The major findings of the study are presented here.

**Section I Background Information**

- **Personal Information:** The age of the respondents ranged between 19 to 39 years where mean age of the respondents was 24.91 years. A little less than two - third (65.57%) of the respondents were in age group of 19 to 25 years. More than one - half (54.09%) of the respondents were males. The height of the respondents ranged between 148 to 180 cms and the mean height was 162.51 cms. It was found that less than one - half (44.26 %) of the respondents were of height ranging between 148 to 158 cms. The weight of the respondents ranged between 43 to 82 kg and the mean weight was 51.91kg. Majority (80.33%) of the respondents had weight between 43 to 56 kg. It was also found that that less than two - third (60.65%) of the respondents were unmarried. The years of service of the respondents as cashier ranged between 12 to 110 months. It was found that majority (93.44%) of the respondents had worked as cashier for past 12 to 60 months.

It was also found that all of the respondents reported that they did not had any musculoskeletal problems before joining as cashier at the present retail stores.

- **Situational Information (work related information):** It was found that all the respondents of selected retail stores had 6 working days in a week and their working hours were 9 hours per day. Majority (81.96%) of the respondents get 1 to 2 breaks in a day and 18.03 per cent of the respondents had 3 to 4 breaks in a day. The duration of tea/coffee breaks in a day was 15 minutes and lunch breaks was 30 to 60 minutes in a day at selected retail stores. Majority (81.96%) of the respondents had one tea/coffee break in a day. It was also found that less than three - fourth (70.49%) of the respondents had one lunch break of 60 minutes in a day while more than one - fourth (29.50%) of the respondents had one lunch break of 30 minutes in a day.
- **Situational Information (Environmental Parameters viz. noise, illumination, temperature and humidity):** According to Rangwala, 2014 the recommended level of noise for retail stores is 50-60 dB. It was found that among the 9 retail stores, store 1 had the higher noise level during morning shift (73.2 dB) and store 3 during afternoon (82.3dB) and evening shift (86.6dB). According to Chauhan 2016, the recommended level of illumination for retail stores is 500 lux. It was found that among the nine stores the illumination level at store 4 and 6 was found higher during the three shifts viz. morning (1425.3 lux), afternoon (1457 lux), evening (1425.3 lux) and morning (1386.3 lux), afternoon (1456.3 lux), afternoon (1399 lux) respectively. Further, it was revealed that store 1 had higher temperature level during all three shifts i.e, 29.1$^{o}$C during morning time, 29.1$^{o}$C during afternoon and 31.6$^{o}$C during evening. It was also found that the highest humidity at checkout counters of selected retail stores during morning shift was recorded from store 5 (61.6%), store 1 and store 8 had higher humidity (61.6%) during afternoon. Store 1 had higher humidity (72.33%) in the evening.

**Section II Extent of health problems experienced due to selected Environmental Parameters of checkout counters:** It was found that less than three fourth (70.49%) of the respondents experienced tiredness to high extent of due to noise at checkout counters. The mean weighted scores were found high for physiological health problems such as tiredness (2.68), headaches (2.40) and increased muscular tension (2.32). Less than two-third (62.29%) of the respondents experienced stress to high extent due to noise. The mean weighted scores were found high for psychological health problems such as stress (2.62), frustration fatigue (2.52) and aggressive nature (2.50). It was found that more than two - third (67.21%) of the respondents faced high extent of eyestrain due to illumination level. The mean weighted score were found high for physiological health problems such as eyestrain (2.67), headache (2.63) and burning of eyes (2.14). More than one-half (54.45%) of the respondents experienced frustration fatigue to high extent due to illumination level at checkout counters. The weighted mean score were found high for psychological health problem such as stress (2.59), frustration fatigue (2.47) and aggressive nature (2.44). Moreover, less than two - third (62.29%) of the respondents experienced frustration fatigue to high extent due to temperature and humidity at checkout counters. The mean weighted score were found high for physiological health problem viz. frustration fatigue (2.59), muscle cramps (2.32) and dryness in skin (1.85). Less than two – third (60.65%) of the respondents experienced stress to high extent due to temperature and humidity at checkout counters. The mean weighted score were found high for psychological health problems such as stress (2.60), irritation (2.39) and frustration fatigue (2.31).

**Section III Discomforts experienced by the cashiers at checkout counters:** It was found that majority (88.52%) of the respondents experienced discomfort in their upper back (cervical). Less than three-fourth (70.49%) of the respondents had discomforts in their right wrists during last 12 months. It was also found that more than three - fifth (62.29%) of the respondents had discomfort in both shoulder during last 12 month. It was also found that since last 7 days majority (88.52%) of the respondents experienced discomfort in their upper back

(cervical). Three-fifth (60.65%) of the respondents experienced discomfort in their both shoulders. Moreover, 13.11 per cent experienced discomforts in their right shoulder. Also more than one - half (59.01%) of the respondents experienced discomforts in right wrist. Majority (98.36%) of the respondents had experienced discomfort in their lower back (lumber) during last 12 months. More than three-fourth (78.68%) of the respondents had discomfort in their both knees during last 12 months. In lower body during last 7 days majority (98.36%) of the respondents experienced discomforts in their lower back (95.08%). It was also found that the respondents were prevented from carrying out their normal activities during last 12 months due to discomfort experienced in upper back (63.93%), shoulder (52.45%), lower back (75.49%), knees (70.49%) and ankles (63.93%).

**Testing of Hypotheses**

- A significant relationship was found between the discomforts experienced by the cashiers during last 12 months and age.
- A significant relationship was found between the extent of health problems experienced due to illumination and illumination levels at the checkout counters of the selected retail stores during morning, afternoon and evening.
- A significant relationship was found between the discomforts experienced by the cashiers during last 12 months and discomforts that prevented them from carrying out their normal activities during last 12 months.

**Conclusion**

A study was conducted on retail store cashiers of Vadodara city to assess the selected environmental parameters of checkout counters of selected retail stores, to find out the extent of physiological and psychological health problems experienced by the cashiers due to selected environmental parameters of checkout counters viz. illumination, noise, temperature and humidity. The discomforts experienced by the cashiers were also assessed. It was found that the mean age of the respondents was 24.91 years. A little less than two - third (65.57%) of the respondents were in age group of 19 to 25 years. More than one

- half (54.09%) of the respondents were males. The mean height of the respondents was 162.51 cms. The mean weight of the respondents was 51.91kg. Less than two - third (60.65%) of the respondents were unmarried. The years of service of the respondents as cashier ranged between 12 to 110 months and majority (93.44%) of the respondents had worked as cashier for past 12 to 60 months. It was also found that all of the respondents reported that they did not had any musculoskeletal problems before joining as cashier at the present retail stores. Among the 9 retail stores, store 1 had the higher noise level during morning shift and store 3 had the higher noise level during afternoon and evening shift. The illumination level was found higher at Store 4 and 6 during the three shifts viz. morning, afternoon and evening. The temperature level was found higher at store 1 during all three shifts and the highest humidity at checkout counters of selected retail stores during morning shift was recorded from store 5 and store 1. Store 8 had higher humidity during afternoon and store 1 had higher humidity in the evening. Physiological problems experienced by the cashiers due to noise were tiredness, headache. Psychological health problems experienced by the cashiers due to noise were stress and aggressive nature. It was also found that majority of the respondents experienced eyestrain and headaches due to illumination. Psychological health problems experienced by them due to illumination were stress and frustration fatigue. Due to the temperature and humidity the respondents experienced frustration fatigue and stress. Moreover, it was found that majority of the respondents experienced discomfort in their upper back (cervical), both ankles, feet, lower back (lumber) and knees during last 12 months. Further, the respondents reported discomforts that prevented them from carrying out their normal activities during last 12 months were discomforts in upper back, feet, ankles and lower back.

The discomforts experienced by the cashiers during last 12 months varied with the age of the respondents. The values were found significant in age group 26-32 and 33-39. Therefore, it can be concluded that as the age of respondents increases the discomforts also increase. As the illumination was low than the recommended level at the checkout counters the higher is the health problems

reported by the cashiers due to illumination at the checkout counters and vise versa. Further, as the discomforts experienced by the cashiers during last 12 months was more, the more were they prevented from carrying out their normal activities during last 12 months.

## Implications of the Study

The findings of the present study had the following implications:

### For the Field of Family and Community Resource Management

The field of Family and Community Resource Management has “Ergonomics” and “Interior Designing” as subjects offered to the students, at Post Graduate and Doctoral level. The findings of the study will help the students to learn various types of physiological and psychological health problems caused due to environmental parameters of workplace. The study will also help the Interior Design specialization students to consider recommendations of the environmental parameters required to design checkout counters of retail stores.

### For Interior Designers and Architects

The findings of the present study would act as a feedback to interior designers to know the health problems faced by the cashiers at checkout counters of retail stores. They can incorporate the recommendations given for environmental parameters by “Occupational Health and Safety Administration” (OSHA), “Bureau of Indian Standards”, “Lighting Technology Center”, US Davis and “Health and Safety Executive” for designing of retail stores and checkout counters. Poor work environment can not only affect the health of people at work but is also linked to sick building syndrome. The Architectures and Interior designers can consider such problems related to workers and work environment while designing the interiors.

**For the Government**

The findings of the present study revealed that the cashiers experienced various health problems experienced due to environmental parameters. They also faced body discomforts in various body parts while working at the checkout counters. Therefore, further researches would be encouraged by the government across the nation as a consequence the obtained results should be used in developing national as well as local database. The government can also develop guidelines and policies to reduce such health problems and body discomforts of the workers. This will be of immense help to engineers, designers, ergonomists, supervisors, managers or occupational health care professionals for designing or modifying facilities and layouts at the retail stores.

**For the Authorities of the retail stores**

The present study would be beneficial to the authorities of the retail stores to consider corrective measures in designing environmental parameters at checkout counters to reduce the health problems faced by the cashiers. Also cashier's discomforts can be reduced by adopting the recommended guidelines and increase their productivity, performance, satisfaction and overall well-being of the cashiers.

**For the cashiers**

The findings of the study revealed that cashiers experienced discomfort mainly in their lower back, upper back, neck, knees, feet and ankles. Hence, the cashiers can reduce their body discomforts by adopting the suggested ergonomic tips.

**Recommendations for the Future Studies**

1. An investigator in other cities of Gujarat or different states in India can undertake similar type of research to assess the environmental parameters of checkout counters of retail stores.

2. A similar study can be conducted on a larger sample size, different industries and different research areas.
3. A study can be conducted on comparison of other types of counters at the retail stores.
4. A study can be conducted to assess the postures adopted by the cashiers at the checkout counters.
5. A study can be conducted on redesigning of checkout counters of retail stores.
6. A systematic comparative study can be conducted between work technique and musculoskeletal disorders prevalent among the cashiers.
7. A study can be carried out to investigate the risk of musculoskeletal disorders in other categories of workers.

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# *Appendix*

## APPENDIX – I

Respondent No: _____

### Interview Schedule

### Section I: Background Information of the respondents

**A) Personal Information**

1. Name of the respondent :
2. Age (in years) :
3. Gender Male _____ Female ____
4. Height (in cms) :
5. Weight (in kg) :
6. Marital status Married ____ Unmarried____
7. Years of service as cashier :

**B) Work related Information**

1. Number of days at work in a week:
2. Total working hours per day :
3. Number of break in a day :
4. Duration of each breaks in a day :
5. Did you have any kind of musculoskeletal problems before joining as cashier at the present retail store?

   Yes ……. No…….

## Interview Schedule

### Section II: Extent Health problems experienced due to Selected Environmental Parameters

**Please go through the following statements and tick mark (✓) under appropriate column.**

| Sr. No. | Extent of Health problems experienced due to | To great extent | To some extent | To low extent |
|---|---|---|---|---|
| **I** | **Noise** | | | |
| | **Physiological** | | | |
| | a) Ringing of ears | | | |
| | b) Headaches | | | |
| | c) Drowsiness | | | |
| | d) Dizziness | | | |
| | e) High blood pressure | | | |
| | f) Impaired hearing | | | |
| | g) Increase muscular tension | | | |
| | h) Tiredness | | | |
| | **Psychological** | | | |
| | a) Hindrance in conversation | | | |
| | b) Encounter tiredness at work | | | |
| | c) Difficulty in concentration | | | |
| | d) Disturbance in ones Performance of any task | | | |
| | e) Stress | | | |
| | f) Irritation | | | |
| | g) Forget things due to disturbance | | | |
| | h) Aggressive nature | | | |
| | i) Frustration Fatigue | | | |
| **II** | **Light** | | | |
| | **Physiological** | | | |
| | a) Eyestrain | | | |
| | b) Headaches | | | |
| | c) Blurred vision | | | |
| | d) Burning of eyes | | | |
| | e) Red eyes | | | |
| | f) Eye irritation | | | |
| | g) Dry eyes | | | |
| | **Psychological** | | | |

| Sr. No. | Extent of Health problems experienced due to | To great extent | To some extent | To low extent |
|---|---|---|---|---|
| | a) Stress | | | |
| | b) Irritation | | | |
| | c) Frustration Fatigue | | | |
| | d) Aggressive nature | | | |
| | e) Difficulty in performing any tasks | | | |
| **III** | **Temperature and Humidity** | | | |
| | **Physiological** | | | |
| | a) Numbness | | | |
| | b) Dryness in skin | | | |
| | c) Itchy skin | | | |
| | d) Flaky skin | | | |
| | e) Migraine | | | |
| | f) Coughing and throat irritation | | | |
| | g) Dry throat | | | |
| | h) Nasal Blockage | | | |
| | i) Bleeding nose | | | |
| | j) Muscle cramps | | | |
| | k) Fainting | | | |
| | l) Heat exhaustion | | | |
| | m) Dry eyes | | | |
| | n) Frustration fatigue | | | |
| | **Psychological** | | | |
| | a) Stress | | | |
| | b) Frustration Fatigue | | | |
| | c) Irritation | | | |
| | d) Aggressive nature | | | |
| | e) Difficulty in performing any tasks | | | |
| | f) Difficulty in concentration | | | |

## Interview Schedule

## Section III: Extent of Discomfort Experienced by the Cashiers

**Please answer by using the tick boxes ☑**
**-one tick for each question**

**Please note that this part of the questionnaire should be answered, even if you have never had trouble in any parts of your body.**

| Have you at any time during the **last 12 months had trouble (such as ache, pain, discomfort, numbness)** in: | Have you had **trouble** during the **last 7 days:** | During the **last 12 months** have you been **prevented** from carrying out normal activities (eg. Job, housework, hobbies) because of this trouble: |
|---|---|---|
| **1 Neck**<br>No Yes<br>1 ☐ 2 ☐ | **2 Neck**<br>No Yes<br>1 ☐ 2 ☐ | **3 Neck**<br>No Yes<br>1 ☐ 2 ☐ |
| **4 Shoulders**<br>No Yes<br>1 ☐ 2 ☐ in the right shoulder<br>3 ☐ in the left shoulder<br>4 ☐ in both shoulder | **5 Shoulders**<br>No Yes<br>1 ☐ 2 ☐ in the right shoulder<br>3 ☐ in the left shoulder<br>4 ☐ in both shoulder | **6 Shoulders (*both/either*)**<br>No Yes<br>1 ☐ 2 ☐ |

| Have you at any time during the **last 12 months had trouble (such as ache, pain, discomfort, numbness)** in: | Have you had **trouble** during the **last 7 days:** | During the **last 12 months** have you been **prevented** from carrying out normal activities (eg. Job, housework, hobbies) because of this trouble: |
|---|---|---|
| **7 Elbows**<br>No Yes<br>1 ☐ 2 ☐ in the right elbow<br>3 ☐ in the left elbow<br>4 ☐ in both elbows | **8 Elbows**<br>No Yes<br>1 ☐ 2 ☐ in the right elbow<br>3 ☐ in the left elbow<br>4 ☐ in both elbows | **9 Elbows (*both/either*)**<br>No Yes<br>1 ☐ 2 ☐ |
| **10 Wrists**<br>No Yes<br>1 ☐ 2 ☐ in the right wrist/hand<br>3 ☐ in the left wrist/hand<br>4 ☐ in both wrists/hands | **11 Wrists**<br>No Yes<br>1 ☐ 2 ☐ in the right wrist/hand<br>3 ☐ in the left wrist/hand<br>4 ☐ in both wrists/hands | **12 Wrists**<br>No Yes<br>1 ☐ 2 ☐ |

| Have you at any time during the **last 12 months had trouble (such as ache, pain, discomfort, numbness)** in: | Have you had **trouble** during the **last 7 days:** | During the **last 12 months** have you been **prevented** from carrying out normal activities (eg. Job, housework, hobbies) because of this trouble: |
|---|---|---|
| **13 Hands**<br>No Yes<br>1 ☐ 2 ☐ in the right wrist/hand<br>3 ☐ in the left wrist/hand<br>4 ☐ in both wrists/hands | **14 Hands**<br>No Yes<br>1 ☐ 2 ☐ in the right wrist/hand<br>3 ☐ in the left wrist/hand<br>4 ☐ in both wrists/hands | **15 Hands**<br>No Yes<br>1 ☐ 2 ☐ |
| **16 Upper back (Cervical)**<br>No Yes<br>1 ☐ 2 ☐ | **17 Upper back (Cervical)**<br>No Yes<br>1 ☐ 2 ☐ | **18 Upper back (Cervical)**<br>No Yes<br>1 ☐ 2 ☐ |
| **19 Lower back (small of the back) Lumber**<br>No Yes<br>1 ☐ 2 ☐ | **20 Lower back (Lumber)**<br>No Yes<br>1 ☐ 2 ☐ | **21 Lower back (Lumber)**<br>No Yes<br>1 ☐ 2 ☐ |
| **22 One or both hips/buttocks**<br>No Yes<br>1 ☐ 2 ☐ | **23 Hips/buttocks**<br>No Yes<br>1 ☐ 2 ☐ | **24 Hips/buttocks**<br>No Yes<br>1 ☐ 2 ☐ |

| Have you at any time during the **last 12 months had trouble (such as ache, pain, discomfort, numbness)** in: | Have you had **trouble** during the **last 7 days:** | During the **last 12 months** have you been **prevented** from carrying out normal activities (eg. Job, housework, hobbies) because of this trouble: |
|---|---|---|
| **25 One or both thighs**<br>No Yes<br>2 ☐ 2 ☐ | **26 Thighs**<br>No Yes<br>1 ☐ 2 ☐ | **27 Thighs**<br>No Yes<br>1 ☐ 2 ☐ |
| **28 One or both knees**<br>No Yes<br>1 ☐ 2 ☐ | **29 Knees**<br>No Yes<br>1 ☐ 2 ☐ | **30 Knees**<br>No Yes<br>1 ☐ 2 ☐ |
| **31 One or both Ankles**<br>No Yes<br>1 ☐ 2 ☐ | **32 Ankles**<br>No Yes<br>1 ☐ 2 ☐ | **33 Ankles**<br>No Yes<br>1 ☐ 2 ☐ |
| **34 One or both feet**<br>No Yes<br>1 ☐ 2 ☐ | **35 Feet**<br>No Yes<br>1 ☐ 2 ☐ | **36 Feet**<br>No Yes<br>1 ☐ 2 ☐ |

# APPENDIX – 2

**Record sheet**

**For Measuring Illumination, Noise, Temperature and Humidity level**

**Morning Shift**

1. Day :
2. Date :
3. Time :

| Stores | Noise level (lux) | | | | Illumination level (dBA) | | | | Temperature level ($^{o}$C) | | | | Humidity level (%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | Avg. | 1 | 2 | 3 | Avg. | 1 | 2 | 3 | Avg. | 1 | 2 | 3 | Avg. |
| 1 | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | |

**Afternoon Shift**

4. Day :
5. Date :
6. Time :

| Stores | Noise level (lux) | | | | Illumination level (dBA) | | | | Temperature level ($^{o}$C) | | | | Humidity level (%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | Avg. | 1 | 2 | 3 | Avg. | 1 | 2 | 3 | Avg. | 1 | 2 | 3 | Avg. |
| 1 | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | |

**Evening Shift**

7. Day :
8. Date :
9. Time :

| Stores | Noise level (lux) | | | | Illumination level (dBA) | | | | Temperature level ($^{o}$C) | | | | Humidity level (%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | Avg. | 1 | 2 | 3 | Avg. | 1 | 2 | 3 | Avg. | 1 | 2 | 3 | Avg. |
| 1 | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | |

# *Abstract*

## ABSTRACT

Retail sector in India is the second largest employer after agriculture. A team of several workers are involved in these retail stores such as cashier, sales associate, store manager, cleaning and maintenance worker, security guard, team leader and floor manager. The present study focuses on the cashiers of the retail stores. The cashiers perform several roles such as scanning and billing the products purchased by the customers and bagging the products purchased. All these tasks are carried out by them in standing position. The working time of the cashiers of the stores is 8-9 hours per day. They further have to perform repetitive movements of hands and legs while standing. Therefore, the retail store cashier's work has been associated with high rates of musculoskeletal discomforts. Moreover, the environmental parameters of the checkout counters of the retail stores such as noise, illumination, humidity and temperature have impact on the cashier's physiological and psychological health which reduces their productivity. Hence, the study was conducted to assess the environmental parameters of the checkout counters, to find out the extent of physiological and psychological health problems experienced by the cashiers of selected retail stores. The study also aimed to assess the discomforts experienced by the cashiers of selected retail stores. The research design for the present study was descriptive in nature. The samples for the present study was selected from nine different retail stores of Vadodara city. These retail stores were selected through convenience sampling technique. The data were collected from 61 respondents who were working as a cashier for minimum 12 months in the selected retail stores of Vadodara city through purposive sampling. The data were collected through an interview schedule and record sheet. The interview schedule consisted of a standardized questionnaire namely, "Nordic Questionnaire" to assess the body discomforts of the cashiers. The scale extent of health problems experienced due to selected environmental parameters was validated by the experts from the related field and the reliability was established which was found to be 0.906.

The mean age of the respondents was 24.91 years and the mean height and weight was 162.51 cms and 51.91kg respectively. Less than two - third (60.65%) of the respondents were unmarried and majority (93.44%) had worked as cashier for past 12 to 60 months. All the respondents of selected retail stores had 6 working days in a week and their working hours were 9 hours per day. Majority (81.96%) of the respondents had one tea/coffee break in a day and less than three - fourth (70.49%) of the respondents had one lunch break of 60 minutes in a day while more than one - fourth (29.50%) of the respondents had one lunch break of 30 minutes in a day. It was also found that all of the respondents reported that they did not had any musculoskeletal problems before joining as cashier at the present retail stores. It was found that all the selected retail stores had excess dB (decibels) than recommended level i.e 60dB which was found more during evening shift. The excess illumination than recommended level i.e 500 lux was found higher during the afternoon shift. The temperature was found higher at store 1 during all the three shifts and humidity was found higher at store 5 during morning, store 1 and 8 during evening and at stores 1 during evening. Physiological problems experienced by the cashiers due to noise were tiredness, headache and stress and aggressive nature as psychological health problems. It was also found that majority of the respondents experienced eyestrain and headaches due to illumination levels and stress and frustration fatigue as psychological health problems. Due to the temperature and humidity the respondents experienced frustration fatigue and stress. Moreover, it was found that majority of the respondents experienced discomfort in their upper back (cervical), lower back (lumber), knees, ankles and feet during last 12 months. Further, the respondents reported discomforts in upper back, feet, ankles and lower back that prevented them from carrying out their normal activities during last 12 months.

The discomforts experienced by the cashiers during last 12 months varied with age of the cashiers. A significant relationship was found between the extent of health problems experienced due to illumination and illumination levels at the checkout counters of the selected retail stores during morning, afternoon and

evening. Also a significant relationship was found between the extent of discomforts experienced by the cashiers during last 12 months and discomforts that prevented them from carrying out their normal activities during last 12 months. Thus, there is a need to suggest ergonomic tips for reducing discomforts and improving environmental parameters mainly illumination at the checkout counters of the selected retail stores. This will help them to reduce their body discomforts, physiological and psychological health problems of the cashiers hence increasing their productivity. The study would also be beneficial to designers in designing checkout counters of retail stores to consider the health problems and discomforts experienced by the cashiers. Moreover, it will also drag the attention of the retails store authorities in considering the health problems and discomforts of their employees which help them to reduce absenteeism and increase productivity. The study also highlighted the important recommendation of noise and illumination for the retail stores.