

**ASSESSMENT OF COMPRESSIONAL PROPERTIES IN WEARING TIGHT PANT  
LEGGINGS**

**BY**

**RIDHUVARSHINI S**

**(21PTF013)**

**A Thesis submitted to the**

**Avinashilingam Institute for Home Science and Higher**

**Education for Women Coimbatore -641043**

**IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE**

**DEGREE OF MASTER OF SCIENCE IN**

**TEXTILES AND FASHION APPAREL**

**MAY 2023**

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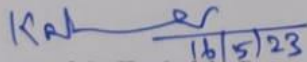
Education for Women Coimbatore -641043

In Partial Fulfilment of the Requirement for the Degree of

MASTER OF SCIENCE IN TEXTILES AND FASHION APPAREL


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Certified as Bonafide Research Work

  
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### DECLARATION

I declare that the dissertation entitled "ASSESSMENT OF COMPRESSIONAL PROPERTIES IN WEARING TIGHT PANT LEGGINGS" submitted by me for the degree of Master of Science (M.Sc.) is the record of work carried out by me during the period from 2022 to 2023 under the guidance of **Dr.(Mrs) K. KALAIARASI** M.Sc., M.Phil.,Ph.D., SLET., Associate Professor and Head, Department of Textile and Clothing, Avinashilingam Institute for Home Science Higher Education for Women, Coimbatore -642043 and has not formed the basis for the award of any Degree, Diploma, Associate ship, Fellowship, Titles in this University or any other similar institution of higher learning.

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**RIDHUVARSHINI S**

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# **INTRODUCTION**

## **CHAPTER - 1**

### **INTRODUCTION**

Compression garments are specialised articles of clothing that are made up of elastomeric fibres and yarns. They are worn to exert a significant amount of mechanical pressure on the surface of certain body zones in order to support, compress, and stabilise the tissues that lie beneath the skin. Compression clothing is intended to be worn so that it is in close proximity to the skin. It should be characterised by elasticity, superior wearing comfort, and lightness in addition to its general lightness. Functional compression wear, which will boost one's self-confidence, exercise ability, athletic performance, blood circulation, energy, physical recuperation, and reduced muscular fatigue, these features are typically obtained by spinning yarns with particular functional properties. This process is known as functional yarn spinning. In the realms of medicinal applications, athletic applications, and body-shaping applications, they have been the subject of extensive research and have been used extensively. Since their introduction, medical professionals have found numerous applications for compression clothing. Compression clothing has quickly become an industry standard in the world of athletic apparel. It is widely believed that wearing sports apparel with a compression distribution of moderate intensity will improve the performance of athletes, reduce the risk of injury, and speed up the recuperation process. This belief underpins the widespread usage of such apparel in athletics and fitness activities. Similarly, compression garments with a moderate amount of pressure that are designed to have a close fit and are becoming increasingly popular for the aim of body sculpting.

Compression garments are garments that apply pressure to the body in order to provide health benefits to the wearer. Some of these benefits include improving blood circulation, moulding the body, and assisting in the recovery process following medical treatments. Elastic fabrics are required for compression garments because the amount of stretching that can be achieved by the fabric as well as its ability to maintain the stretching force are directly related to the amount of compression that can be achieved. However, there is currently very little information about the fabric and its mechanical properties, and there is a demand from compression garment manufacturers to better understand the properties of the fabric and their applicability. In addition to this demand, there is very little information about the fabric and its mechanical properties.

Studies conducted in the field of sports sciences on the effects of compression wear reveal that venous pressure drops when exercising while wearing compression stockings or tights, which results in an increase in the flow of venous blood. Muscle damage, as well as

tremors, vibrations, and soreness, are all reduced after exercise, which contributes to the overall improvement in the effect of exercise. The idea that the lower body would be tightened under constant pressure to compensate for the body form is driving an increase in the popularity of leggings, which contrasts with the traditional use of stockings. On the other hand, generic leggings, in contrast to medical compression stockings, are not made with the garment pressure that is provided to each individual body part in mind. Therefore, leggings can potentially obstruct the flow of blood from the ankles to the thighs if they are designed to apply constant pressure to all parts of the lower extremities, without any gradual increase in the pressure value. Women are more likely to suffer from health conditions like varicose veins, for instance, than males are. Compression stockings are frequently the first line of therapy for varicose veins. These stockings are available in a wide range of lengths and apply varying pressures in order to support the flow of blood through the veins. Medical compression stockings are an efficient method of treating varicose veins. They do this by narrowing or closing the veins in the lower legs or deeper veins in order to prevent blood reflux. Depending on the severity of the symptoms, a doctor may prescribe medical compression stockings with varying degrees of stiffness.

The wearers' health is significantly impacted by the compression garments' effectiveness, safety, pressure distribution, and retention capabilities. These are all very important components of the garments. The pressure performance of compression garments, which may be broken down into magnitude and durability, is the most important indicator, and it is primarily determined by the mechanical qualities of the garment as well as the fit of the garment. The amount of pressure that is applied by the compression garment is one of the most significant factors to consider when assessing the effectiveness of the treatment, as well as comfort, wellness, and safety. Compression garments, such as stockings, bandages, sleeves, gloves, body suits and face masks, are custom-made to fit a specific area of the body. These garments are created and manufactured individually. They have been put to use in the treatment of chronic venous disease, in the care of scars, in orthopaedic supports, in sportswear, and in the shape of the body.

This study was conducted with the intention of determining the extent to which compressional qualities of tight wear pant leggings are related to one another.

# **REVIEW OF LITERATURE**

## **CHAPTER - 2**

### **REVIEW OF LITERATURE**

This study aimed to determine the qualities consumers wanted and the issues they had with their leggings. The historical context, contemporary market, and discussion of the make-up, performance attributes, and maintenance of leggings are all revealed through a survey of pertinent literature. The property on study's review of the literature is divided into the following categories:

#### **2.1. Compression garments**

- 2.1.1. Medicated compression garments
- 2.1.2. Non medicated compression garments
- 2.1.3. Medicated compression – purpose-types-usage
- 2.1.4. Garment compression level
- 2.1.5. Advantages of compression garments
- 2.1.6. Disadvantages of compression garments

#### **2.2. Leggings**

- 2.2.1. History of leggings
- 2.2.2. Materials used for leggings
- 2.2.3. Types of leggings
- 2.2.4. Manufacturing of leggings
- 2.2.5. Leggings leading brand in India
- 2.2.6. Health related issues with leggings

## **2.1. Compression garments**

Compression garments are specialised clothes made of elastomeric fibres and yarns that are worn to provide significant mechanical pressure to specific body zones in order to compress, support, and stabilise underlying tissues. They have received extensive investigation and are used in the domains of medicine, sports, and body-shaping applications. (Macray et al, 2011)

Compression garments (CGs) offer a way to compress and maybe stabilize/support underlying tissue by delivering mechanical pressure at the body's surface. The body parts compressed and administered pressures ostensibly mirror the garment's goal, which is to reduce discomfort brought on by activity or support certain aspects of current or future exercise performance. (Wang et al, 2011)

Compression garments are articles of clothing, including pantyhose, sleeves, socks, etc. that offer support. They are particularly helpful for those who must stand for extended periods of time or for those with poor circulation. The level of compression in the clothing might vary. The higher degrees need a prescription from a doctor. Particularly when travelling, compression clothing worn on the legs can help avoid deep vein thrombosis and minimise swelling. (Elokda, 2007)

### **2.1.1. Medicated compression garments**

Additionally useful for compression therapy, compression clothing has been proven to significantly lessen lymphedema. There are clothes available in a variety of sizes and compression levels for different body areas, such as the legs, arms, and trunk. Compression clothing can be bought already made or built to order. To guarantee correct fit and efficient therapy, the therapist must adhere to manufacturer standards for measuring patients for custom-fit clothing. (Williams et al., 2015)

The surgical ant embolism stocking is the least bulky compression item. This item offers compression up to 17 mm Hg, but it should only be used to keep immobile patients from developing thromboses or emboli, not to treat lymphedema. There are four different classifications of compression stockings that are appropriate for treating edoema, and they can be used in conjunction to apply even more pressure. Although there are different recommendations, in general, compression of 30 mm Hg for the upper extremity and 80 mm Hg for the lower extremity is appropriate. (Franke et al., 2021)

Compression therapy was first mentioned in the Corpus Hippocraticum (450–350 BC). It was thought that applying pressure may counteract the negative effects of gravity and maintain posture, which would aid in the lower limbs' ability to repair wounds. In 1440, bandages were used to apply compression therapy, a conservative method of treating varicose veins. However, it wasn't until the end of the 19th century that bandages started to be used commercially. In the 19th century, England also produced the first elastic compression stockings with gradual compression. Since it has been used for burn treatment for the past 50 years, compression therapy is widely acknowledged to speed up the maturation of scars and reduce the occurrence of hypertrophic scars. (Martin and others, 1878)

For many years, compression apparel has been used for medical purposes. Compression clothing is becoming a staple of the sportswear industry. Widely used in athletics and fitness activities, sportswear with moderate compression distribution is predicted to improve athlete performance, lower the risk of injury, and hasten the healing process (Born et al., 2013). Similar to this, tight-fitting compression clothing with a light pressurisation for body sculpting purposes is growing in popularity. (Barhoumi et al., 2022)

Additionally, compression clothing has been used to apply pressure to the muscles of the body to increase blood flow, which enhances performance, lowers the risk of injury, and speeds up muscle recovery during and after exercise. Therefore, wearing a compression garment during sports activities, particularly a gradual compression garment, is becoming increasingly common. Many professional players and athletes already regularly don compression clothing. Compression clothing is increasingly used as shapewear to improve one's appearance, including by elevating the breasts, generating appealing shapes, and minimising the size of the abdomen. They are worn below regular, loose clothing. The majority of medical compression clothing, including body suits, gloves, stockings, and sleeves, are specially created and constructed for a specific area of the body. Depending on the length of time that is required for medical treatment, they are worn. A compression garment has a circumference that is smaller than the wearer's body size. The garment stretches while being worn, giving the best compression. Depending on the situation, specialised clothing may also be utilised to apply targeted compression to particular muscle areas. Although a low level of compression (5-15 mmHg) can also produce good clinical results, the pressure typically exceeds the capillary pressure, which is 24 mmHg (Van Den 2007).

Decongestive therapy requires the use of compression garments. The edoema decrease attained

with MLD and compression bandaging can be maintained with the use of appropriately fitted clothing. A poorly fitting garment may be dangerous since it could result in a localised edoema. Medical compression clothing is elastic in both the longitudinal and transverse directions, providing two-way stretch. Laplace's law governs how pressure is distributed underneath compression clothing, just like it does with compression bandages. The pressure from the garment will be highest above the ankle or wrist and least over the bulk of the limb. Joint movements are made easier and tiny changes in limb length are compensated for by the garment's longitudinal elasticity. (Kathleen 2022)

The standard of care for treating hypertrophic scars is compression clothing. The use of such clothing begins with the healing of wounds. First, bandages made of plastic elastic (ACE), cotton elastic (Tubigrip), or adhesive elastic (Coban) are wrapped tightly around the injured areas. The scarred area takes on a more solid shape when the edoema goes away, at which point pressure garments created to order are put on. Following a burn, these garments should typically be worn 23 hours per day for up to 2 years. For many patients, following this regimen is challenging. Although the effectiveness of this treatment has not been proven, several studies on patients with moderate to severe scarring show some improvement in clinical appearance. A new systematic study that supports the use of silicone gel sheeting for immature epithelialized burn wounds with a high risk of hypertrophic scarring has also been published. Other complementary treatments for scarring include laser therapy, intense pulsed light, steroids, exercise, and fat injection, though the evidence for each of these approaches is weak. (Jeffrey, 2020)

### **2.1.2. Non medicated compression garments**

#### Non-medical compression garment regulation

Non-medical compression clothing is sold commercially and is unregulated, just like any other type of clothing. Therefore, the makers of these goods are not responsible for any injuries brought on by the use of their clothing. Non-medical compression apparel is produced similarly to other types of clothing, thus the manufacturer determines the price depending on the expenses of materials, labour, and distribution. These garments are less expensive than medical compression garments because of the open market production method. Non-medical compression apparel isn't considered durable medical equipment, therefore insurance won't pay for it. (Angelakos et al., 2020)

Deep vein thrombosis risk is decreased with the usage of antiembolism stockings. They offer gradient compression, much like graduation compression stockings. They don't meet the technical requirements for usage by mobile patients because they are made for bedridden individuals. Despite the fact that the phrases "antiembolism stockings" and "graduated compression hosiery" are sometimes used interchangeably and both deliver graduated compression, they differ in terms of the amount of compression and the indications they are intended for. (Lim, 2014)

Non-medical support hosiery is frequently used to relieve heavy, aching, and fatigued legs, such as flight socks and elastic support stockings. Compared to graduated compression stockings, they typically apply a significantly less compression force. The compression is not progressive; it is uniform. They are exempt from the exacting medical and technological requirements that graduated compression stockings must meet. They are frequently available without a prescription over the counter (Wollina, 2006).

The sub-bandage compression pressure that the garment applies at the ankle level determines the classification of graduated compression stockings. Based on laboratory data, the manufacturer determines the pressures. There are various standards used to categorise pressure levels. Unfortunately, there is no universally accepted standard, which might be confusing. The terms low compression and class 1 generally refer to pressures under 20 mm Hg, medium compression and class 2 generally refer to pressures between 20 and 30 mm Hg, and high compression and class 3 generally refer to pressures beyond 30 mm Hg. The elasticity and stiffness of the stocking material, the size and form of the wearer's legs, as well as the wearer's movements and activities, all have an impact on the overall pressure. (Paulfreyman, 2006)

### **2.1.3. Medicated compression – purpose-types-usage**

A frequent treatment to assist improve blood flow in your lower legs is compression therapy. Typically, elastic stockings or wraps are used. Your legs, ankles, and feet are compressed by the elastic. This aids in preventing fluid and blood buildup as well as blood pooling in certain locations. (Beliard et al., 2015)

The types of compression therapy devices include:

- **Compression stockings:** Stockings that go up to the knee are the most common type of compression apparel. If swelling extends above your knee, you may need longer stockings or tights that come up to your waist.
- **Bandages and wraps:** Elastic bandages and Velcro wraps may be easier to apply for people who have difficulty putting on socks. Bandages are usually applied in multiple layers.
- **Inflatable devices:** These garments fully cover the legs and inflate to provide pressure. They are mostly used by athletes.

The amount of pressure that compression socks provide is rated by manufacturers. Your condition will determine how much compression you require. Compression is measured in mmHg, or millimetres of mercury. Compression stockings are not rated on a consistent scale. The following are the various types of pressure:

- Low (less than 20 mmHg).
- Medium (20 to 30 mmHg).
- High (greater than 30 mmHg).

Low-compression stockings can be purchased over-the-counter. If you stand or sit for extended periods of time, or if you are pregnant, they might be a good option. Before purchasing over-the-counter compression stockings, speak with your doctor.

### **Stockings rated 20 mmHg or higher require a prescription.**

Compression therapy is advised by medical professionals for illnesses brought on by poor blood circulation. These consist of:

#### **Chronic venous insufficiency**

This frequent disease affects the veins in the legs. It happens when the veins' walls are fragile and their internal valves aren't functioning properly. Impaired blood flow occurs from the legs to the heart. Consequently, blood accumulates in the legs.

Deep vein thrombosis (DVT) can lead to chronic venous insufficiency. Age and prolonged sitting or standing might also cause it. By contracting your leg muscles, compression therapy helps lessen chronic venous insufficiency. This aids in pushing blood back to the heart against gravity. (Rabe et al, 2020)

### **Varicose veins**

Chronic venous insufficiency is the root cause of these veins. Under your skin, varicose veins resemble raised, looping ropes. Varicose vein pain and edoema may be reduced with compression therapy.

### **Deep vein thrombosis (DVT)**

This is a blood clot that commonly forms in a deep vein in the leg. As a result of the clot's obstruction of blood flow, blood and edoema may accumulate behind it.

People who are at risk for deep vein thrombosis may benefit from compression therapy, according to medical professionals. Among the risk elements are:

- Carrying excess weight.
- Chemotherapy.
- Physical inactivity or immobility.
- Pregnancy and postpartum, up to six weeks after birth.

### **Swelling (edema) of the feet, ankles or legs**

When fluid gets trapped in your tissues, swelling happens. Gravity has a tendency to cause fluid to collect in the legs, but our bodies are capable of preventing this in a variety of ways. There are some circumstances, nevertheless, where pooling still happens. Swelling in your legs, ankles, and feet may be brought on by:

- Chronic venous insufficiency.
- Congestive heart failure.
- Lymphedema.

- Pregnancy.
- Sitting or standing in one place for a long time.

Compression therapy helps by using pressure to move fluid and prevent it from accumulating.

### **Leg ulcers and wounds**

Open sores are ulcers. The legs, ankles, and feet are frequently affected, though they can happen elsewhere on the body. Leg and foot ulcers are more likely to occur in people with diabetes, varicose veins, and impaired circulation. Compression therapy can enhance recovery from leg ulcers and wounds.

### **Orthostatic hypotension**

The sudden decrease in blood pressure that takes place when a person stands up from a sitting or lying position. The symptoms of low blood pressure can include feeling lightheaded or dizzy. When you stand, your legs don't send enough blood back to your heart, which can cause a condition called orthostatic hypotension. This condition can be treated with compression therapy, which works by forcing blood that has been pooling in your legs back towards your heart. Improved blood circulation in the legs, along with decreased discomfort and edoema, might result from using compression therapy. (Granberry et al., 2018) In addition, it can be of assistance when:

- Heal ulcers and wounds caused by blood pooling.
- Manage conditions such as chronic venous insufficiency and orthostatic hypotension.
- Prevent deep vein thrombosis.

Most of the problems people experience with compression therapy are not severe. They include:

- Skin irritation.
- Discomfort or pain.
- Bacterial or fungal

- Swelling of the lower foot and toe area (where compression is usually lower).

Rarely, severe side effects can occur, such as:

- Nerve damage.
- Soft tissue damage.
- Superficial thromboembolism.

#### **2.1.4. Garment compression level**

Millimeters of mercury (mmHg) are used to measure the different levels of compression, and grades are used to differentiate between the levels. According to Mackenzie (2015), the following is a listing of compression grades:

##### **Medical grade 1:**

- 8 to 15 mmHg (mild compression)
- 15 to 20 mmHg (moderate compression)
- 20 to 30 mmHg (firm compression)

##### **Medical grade 2:**

- 30 to 40 mmHg (extra firm compression)

##### **Medical grade 3:**

- 40 to 50 mmHg (prescription-level compression)

The level of compression is denoted by a range of numbers, such as "20-30 mmHg," which indicates that the amount of compression will not be lower than 20 mmHg and will not be more than 30 mmHg. "millimetres of mercury" is the name of the unit of measurement, which is a measurement of pressure and is also employed in the measurement of blood pressure. Another essential aspect of compression stockings is that most brands, including CEP, Juzo, Mediven, and Sigvaris, gradually increase the amount of pressure in the socks and stockings that they manufacture. The term "graduated compression" refers to a compression

method in which the level of pressure applied to the leg gradually decreases from the ankle to the knee. By knitting a compression stocking in this very particular manner, one is able to increase circulation both up and out of the legs. (If the progressive compression were to go in the opposite direction, away from your feet, there would be disastrous consequences.) Because not all manufacturers of compression stockings correctly graduate the compression, it is important to make sure that you only wear trustworthy brands such as CEP, Juzo, Mediven, and Sigvaris.

A low amount of compression, such as 15-20 mmHg, is an excellent choice for everyday compression stockings to help with mild swelling and tired legs caused by lengthy hours of travel, sitting, or standing. Compression stockings with this level of compression are also a perfect choice for those who want to save money. Compression stockings with 15-20 mmHg are available in a variety of designs, including knee high, thigh high, pantyhose, and pregnancy pantyhose. There is a wide variety of fashions to select from, and they are obtainable for both males and ladies. There are compression socks designed for everyday casual wear that have the appearance of dress socks, as well as cotton socks designed for everyday casual wear. There are additional fashion styles for women that involve sheer fabric. There is also an option for 15-20 mmHg of compression in the sports compression socks that are offered. When they are going to be flying or travelling, many people decide to wear compression ranging from 15-20 mmHg. Because they are convenient and come in a wide variety of fashionable designs, an increasing number of individuals are opting to incorporate 15-20 mmHg of compression into their daily routines. (Groppo, 2019)

### **Medical Grade Class I 20-30 mmHg**

The level of compression that is considered to be the first level of medical grade is 20-30 mmHg. As a result of its ability to offer adequate compression to the legs without being overly strenuous, it is the medical grade that is used the most frequently. The level of compression that ranges from 20 to 30 mmHg is ideal for reducing swelling in the legs, treating spider veins and varicose veins, enhancing performance during physical activity, travelling, and recovering from certain surgical procedures. Women who are pregnant are also discovering the benefits of wearing compression stockings

and are beginning to use 20-30 mmHg to ease the heaviness, edoema, and discomfort in their legs that pregnancy can cause. The level of compression that is 20-30 mmHg can be found in a broad number of styles for both men and women, including knee high, thigh high, pantyhose, and maternity pantyhose styles. These styles can be found in knee high, thigh high, and pantyhose. In addition to sheer fashion styles, dress sock styles, sports sock styles, and opaque fashion styles, manufacturers CEP, Juzo, Mediven, and Sigvaris provide a variety of styles for 20-30 mmHg compression stockings. (Riordan et al., 2021)

### **Medical Grade Class II 30-40 mmHg**

The level of compression that ranges from 30 to 40 mmHg is considered a more robust medical grade class II. It is advised for moderate to severe symptoms associated with leg health. When you have a blood clot or a deep vein thrombosis (DVT), the level of compression that ranges from 30 to 40 mmHg is the one that is recommended. It is also recommended that patients suffering from lymphedema employ a level of compression between 30 and 40 mmHg. When deciding between a compression range of 30-40 mmHg, you should also carefully consider the type of material that the stocking or sock in question should be made of. Because the stocking provides more compression in the 30-40 mmHg strength range, it is a good idea to select a material that has a higher level of durability. It's possible that sheer compression stockings with a pressure range of 30-40 mmHg are more likely to develop snags and holes. Additionally, if you are considering the 30-40 mmHg for a more severe leg health issue, you should consider selecting a fabric that is stronger, such as the Juzo Varin, the Mediven Plus, or the Sigvaris Natural Rubber (although you should be aware that the Sigvaris Natural Rubber contains latex). (Park et al., 2013)

### **Medical Grade Class III 40-50 mmHg**

The level of compression that ranges from 40 to 50 mmHg is considered to be a very powerful compression. People who are thinking about getting this level of compression should make sure they have had an in-depth discussion with their primary care physician or another qualified medical professional about how compression stockings can benefit their health. This level of compression is utilised for the treatment of severe cases of venous stasis, lymphedema, and wound management. (Kline et al., 2018)

## **2.1.5. Advantages of compression garments**

### **Enhance Recovery**

After a strenuous workout, it will help you recover more quickly if you wear compression clothing. By improving blood circulation, the compression wear's inherent elasticity contributes to a reduction in felt discomfort. In addition to this, it helps speed up the process of rebuilding muscle tissues after exercise, which is extremely helpful for healing muscles that have been damaged. Additionally, the compression provided by these garments can aid in the reduction of swelling as well. (Watkins, 2010)

### **Reduce Muscle Soreness**

Compression clothing is thought to raise blood pressure, minimise muscular soreness after exercise, and prevent blood pooling, which are the reasons of the discomfort that you feel after a hard workout. These benefits are thought to be achieved by preventing blood from pooling in the muscles. In addition to this, it has the potential to improve your performance for a longer period of time. (Kostelnik et al., 2018)

### **Provide Support**

When people exercise while wearing the garments, the pressure will be added to their muscles. Because of the additional compression that is being applied to these muscle regions, part of the tension that is being placed on the muscles will be alleviated, and you may experience less muscle soreness and tiredness as a result of your workout. (Lee et al., 2023)

### **Keeps You Dry**

If they are wearing the appropriate attire, they won't have to worry about the discomfort that comes along with sweating. Compression apparel, such as tank tops and slim leggings, is typically constructed of polyester or nylon-related fabrics, both of which assist in expediting the drying process following perspiration.

These clothing do not prevent perspiration from evaporating because they do not repel water; rather, they elevate it upward from the fabric, where it can finally evaporate away on its own. This allows the sweat to escape. This indicates that even if they are sweating heavily all over, the compression garments will still be able to keep them dry.

## Improve Flexibility

The feel of compression clothing is similar to that of elastic, making it ideal for providing pleasant support even during tough activities. Because the fabric is stretchy, it does not restrict the movement of your body in any way.

When you exercise, you engage in a variety of different movements, such as stretching, lifting, and extending; if you are not wearing the appropriate clothing, it may be challenging for you to complete these tasks. When it comes to meeting your need for support during exercise, compression apparel is ideal.

## Breathable

Compression clothing may be constricting and tight, but it also allows air to pass through it. Compression clothing allows air to flow, ensuring that the wearer will remain dry and comfortable during their workout, regardless of the weather.

## Better Perceived Exertion

Garments that have been engineered to provide compression can be a good option for individuals who are seeking for a means to increase the intensity of their workouts without increasing their level of discomfort. The term "low perceived exertion" refers to the fact that wearing compression clothing reduces the amount of effort that is necessary to move around while wearing the garment.

Training with a low perceived exertion is essential if you have a passion for extreme sports or races that test your endurance. According to the findings of previous research, donning compression apparel like shorts and socks during a running workout can help improve how a runner experiences their workout regimen.

## Improve Performance

Better athletic performance is possible for athletes who wear compression clothing. It has been demonstrated that donning certain types of clothing, such as compression shorts, can improve one's vertical leap by as much as 9 percent.

## Stylish Look

Any person who is interested in fitness should have at least one piece of compression

clothing in their arsenal. Not only does it help to prevent muscular damage during workouts, but the compression also contributes to the definition of the muscles. Many people want to show off their sporting outfits to their friends on social media because the world is moving at a faster pace and there are more people using social media. Those who wish to seem confident while also displaying their muscle definition while working out may benefit greatly from wearing compression clothing. (Williams et al., 2014)

### **2.1.6. Disadvantages of compression garments**

According to an article published in UK Health care in 2020, even if there are a number of significant benefits associated with wearing compression garments, one should also give some consideration to the drawbacks. The first thing you need to keep in mind is that you must never wash or dry your compression gear in a conventional washing machine or dryer. The fact that you will have to wash the clothing by hand is a significant challenge, particularly if you are still experiencing some side effects from the operation you recently had. You can get around this issue by purchasing two of the clothes, despite the fact that doing so will obviously set you back a significant amount of money. Compression clothing that does not fit well or that does not provide the necessary support to the wearer can be quite harmful, so it is essential that you find one that does and that you purchase it. A garment that does not fit properly can cause implants to move, can increase the danger of infection, and can also increase the risk of acquiring elevated and lumpy scars around the location of your operation. All of these risks are increased when the garment is worn.

Compression can leave you short of breath at times, despite the fact that it is intended to oxygenate the muscles being compressed. The "optimal" pressure areas for each garment might not function so optimally with your body type, and clothing that are supposed to help some muscles might just plain injure others. The "optimal" pressure points for each garment might not work so optimally with your body type. I was surprised to find that this was consistent not only between companies but also between the many kinds of running tights offered by a given brand. While humans are exercising, functional compression shouldn't cause any discomfort. (Men's journal 2019)

### **List of Disadvantages of Compression Socks**

- 1. They can be too tight for some.**

Some individuals who are not accustomed to wearing clothing that is fitted closely may experience feelings of constriction and discomfort when they try on a pair of compression socks for the first time. Additionally, the optimal pressure points that some types of compression clothing are designed to target might not work as well with particular body types.

## **2. They are uncomfortable to wear in certain conditions.**

Some people find that it is too much effort, particularly during the warmer months, to wear an additional layer of clothes that covers the majority of their legs. There is still less air flow, despite the fact that the majority of compression apparel is designed to wick sweat. And even if you only wear them after you've finished working out, being covered up is far more uncomfortable at a time when you'd much rather be letting your body breathe and cooling off in the fresh air.

## **3. They cause itchiness and dry skin.**

It's possible that some people just naturally have more sensitive skin, whereas the epidermis of others reacts negatively when it's not able to be aired out or dried off immediately after generating a sweat. It is recommended that you apply a moisturising lotion both before and after using compression garments if you have dry skin or itching as a result of wearing the garments. (Xiong et al., 2018)

## **2.2. Leggings**

The term "leggings" refers to a number of different styles of legwear that have developed over the years. In contemporary usage, beginning in the 1960s and continuing ahead, the term has evolved to refer to high-rise, close-fitting, elastic garments that are commonly worn over the legs by women, such as leg warmers or tights. This usage dates back to the 18th century and refers to a piece of men's clothing that wraps around the leg all the way down to the ankle and is typically made of cloth or leather. This section presents a variety of reviews relating to leggings and the many characteristics that are associated with them.

### **2.2.1. History of leggings**

In the beginning, leggings were nothing more than two hip-high apparatuses that were distinct from one another and resembled boots. Either leather or chainmail was used in the construction of these items. Later, they morphed into the clothes that we now refer to as tights. During the

Renaissance period, men would wear these tights underneath the hardback of the cot.

Leggings were traditionally considered a male garment until the 19th century, when women finally worked up the nerve to start wearing them.(Raja Impex 2019)

- **The 1950s**

The most significant development of leggings took place in the 1950s. Audrey Hepburn, who was a pioneer in the world of fashion, is credited with introducing the trend of wearing capri pants. In the 1954 production of Sabrina, she wore the slim-down trousers. A great number of other women continued to follow the trend. The trousers were not as stretchy back then, but that was just the beginning of the changes that were to come.

- **The 1960s**

Joseph Shivers is credited with being the first person to ever create lycra leggings in the year 1959. The fashion industry had a very positive reaction to this news. The 1960s saw widespread adoption of skinny, stretchy trousers, which were warmly received at the time. Pants like this were often worn with mod shift dresses by prominent fashion designers of the era, such as Emilio Pucci and Mary Quant.

- **The 1970s**

In the 1970s, leggings developed into a full-fledged fashion trend. This was largely made possible by famous people like Olivia Newton-John and Debbie Harry, along with a number of other well-known names. They were quite dedicated to the leggings fashion trend. However, the style of leggings worn in the 1970s was very dissimilar to what was worn in either of the other two seasons. The majority of the time, leggings were high-waisted disco pants.

- **The 1980s**

The trend of wearing leggings continued throughout the 1980s, when Madonna popularised the look by donning a pair. It was a piece of clothing that she wore frequently. Even now, she continues to use them. The aerobics craze contributed significantly to the growth of the leggings trend. During this time period, leggings featured more vibrant colours and intricate patterns.

- **The 1990s**

In the 1990s, leggings as a fashion item began to experience a slight decline in popularity. Baggy trousers became the dominant style throughout this time period. However, leggings continued to exist despite the fact that they were no longer fashionable.

- **The 2000s**

The trend of wearing leggings was revived in the 2000s, after having been dormant for a few years prior to this time. This time around, the pattern was more pronounced than it had been in the past. Full-length leggings quickly replaced trousers as the garment of choice for women and girls.

- **Present Day**

In this day and age, leggings have developed into an essential piece of clothing for every woman's closet. Leggings are a popular item of clothing for everyone, from famous people to regular people. It is thought of as comfy attire worn for casual occasions.

Never in the history of fashion did anyone wear leggings. It was first developed in the middle of the 14th century. Throughout all of these years, it has only progressed to become the very best version of itself.

### **2.2.2. Materials used for leggings**

Leggings can be made from a variety of fabrics, including spandex, poly/spandex, and any other material that is suitable for closely fitting clothes that are nevertheless pleasant to wear. Leggings, which are a type of pant that is somewhat of a cross between nylon stockings and sweatpants, serve numerous purposes. Leggings are a mainstay item in the closets of many women, despite the ebb and flow of fashion trends, and Fabric Selection Inc. is aware of this fact. As a result, we have a broad selection of fabrics in stock to satisfy the requirements of our customers. Leggings are generally worn while exercising due to the material's ability to make it much easier for folks to move freely and comfortably. As a result, leggings are frequently referred to as yoga pants. At Fabric Selection Inc., our warehouse is stocked with a wide variety of high-quality and fashionable fabrics that may be used to make yoga pants. When it comes to leggings, our warehouse stocks a selection of colours and prints for designers and apparel manufacturers to choose from, regardless of whether the leggings are made of spandex or poly/spandex.

## 1. Athletic Knits & Compression Jersey

- typically polyester or spandex knit
- these fabrics are breathable, mediumweight, and retain their color when stretched

## 2. Polyester Spandex

- prepare for comfort and mobility, perfect for performance or casual wear
- This fabric is a popular choice for yoga and workout apparel. \*\*The honey textured spandex created the viral TikTok leggings that are tummy tucking, anti-cellulite, squat proof, and more.

## 3. Polyester

- very elastic, so it holds its shape well. The yarns are very strong and last and hold up well. Other properties include abrasion and wrinkle resistance. The list keeps going with stain and heat resistance, low absorbency, and resistance to fading or bleaching. Additionally, polyester is more moisture-wicking compared to nylon.
- Polyester with a heavier weight is ideal for colder months. Wicking polyester is available and offers a different weave on the inside that has sweat-wicking properties.

## 4. Fleece Lined Polyester

- This fabric offers a compression style effect with a soft, fleecy touch on its underside and a polyester look on the outside.

## 5. Nylon

- This fabric is abrasion and stain-resistant. It's very durable and easy to clean, highly elastic, resilient, and resistant to mold and mildew. It's built to outlast the sweat and movement from daily activities and high-intensity activities.

## 6. Cotton Spandex or Cotton Lycra

- a common type of legging that offers a soft hand
- Additionally, it's breathable and comfortable. Cotton leggings alone have some minor cons, like lack of resilience and inability to wick away sweat. Cotton spandex is a more suitable combination.

## 7. Wool

- for climates with brutally cold temperatures
- Wool leggings will keep cold pockets of air out, holding all the warm air in.

### 2.2.3. Types of leggings

The leggings based on these major factors

1. Types of leggings based on length and cuts
2. Types of leggings based on fabric, prints and style

#### **Types of leggings based on length and cuts:**

There are four types of leggings based on their length:

#### **1. Ankle-length leggings**

Leggings that end at the ankle are increasingly being used in place of jeans since they are more comfortable and cause the wearer to appear much thinner. In the winter, it is preferable to wear them (ankle-length leggings made of woollen fabric) with ankle-length boots rather than jeans because you won't have to tuck it into your boots. It is highly recommended that women who have shorter legs and/or a larger hip region go for these because they create the illusion of longer and slimmer legs, especially when combined with heels.

#### **2. Mid-Calf Length leggings are usually worn with kurtis, long tops and skirts.**

Mid-calf leggings, which can also be referred to as crop leggings, are leggings that end anywhere between the knees and the ankles. When cut off at this length, mid-calf leggings look incredible paired with longer blouses, high shoes, and a wide variety of other articles of apparel.

### **3. Footed leggings**

Footed leggings are quite comparable to tights, however the fabric is constructed to be slightly more substantial. They do not come with any kind of opening at the bottom, and they also cover the wearer's feet. That's why it's called that. They are versatile enough to be used with shorts, skirts, and even dresses as a layering piece.

### **4. Stirrup leggings:**

The initial wearers of these leggings were horse riders who needed to keep their leggings in place while riding their horses so that they did not ride with their leggings coming up over or over their boots. It also grew popular among women as a form of athletic attire, and they wore it while skiing and horseback riding. After that, it became a part of fashion, and by the 1980s, it had become a part of street fashion. At this moment, they are at the pinnacle of their appeal among women, who put them to use not only as casual wear but also as athletic wear and for jogging.

Types of leggings based on fabric, prints and style:

These are other types of leggings that have come up in fashion:

#### **1. Leggings with cuts or Ripped Leggings**

If you are interested in fashion, you absolutely need to have these leggings because they have cuts in them. They have an alluring and current appearance. These are versatile enough to be worn both during the day and out for a night on the town. My advice would be to wear dark colours like black, grey, or navy blue.

#### **2. Rugged Leggings**

These leggings do not have a rugged appearance, although some of them feature printed images of a rugged appearance. You have the option of going for these if you do not like to expose your skin or those hairs that have not been waxed.

#### **3. Faux-leather & Leather Leggings**

These leggings have even taken the role of jeans in the wardrobes of some young women. You don't have to put up with those really skintight leather jeans or jeggings when you can buy

leather "leggings" or imitation leather instead. not only practical for the colder months but also incredibly fashionable. In order to offer you with even more insulation and defence against the chilly weather, the interior of these leggings have been trimmed with fur.

#### **4. Jeggings**

Jeans plus leggings becomes jeggings. These jeggings look a lot like jeans but are jeggings. There is a greater range of options available to you in them, such as ankle length jeggings, high waist jeggings, low waist jeggings, and so on..

#### **5. Treggings**

Treggings, much like jeggings, are leggings that are designed to give the impression that the wearer is wearing trousers. More like, trousers plus leggings makes treggings. Because the material is more substantial and the leggings resemble trousers, they are a popular alternative among young women and working women who do not like leggings.

#### **6. Printed Leggings**

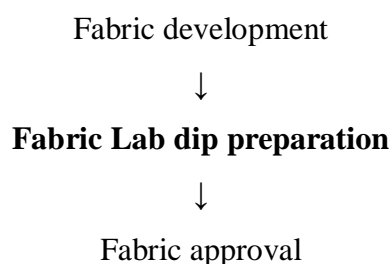
These leggings are available in a wide range of diverse varieties, such as floral prints and monochromatic prints. Some examples of prints include stripes, floral patterns, tribal designs, galaxy prints, and various animal prints such as leopard, tiger, and cheetah prints. The list is endless in its scope.

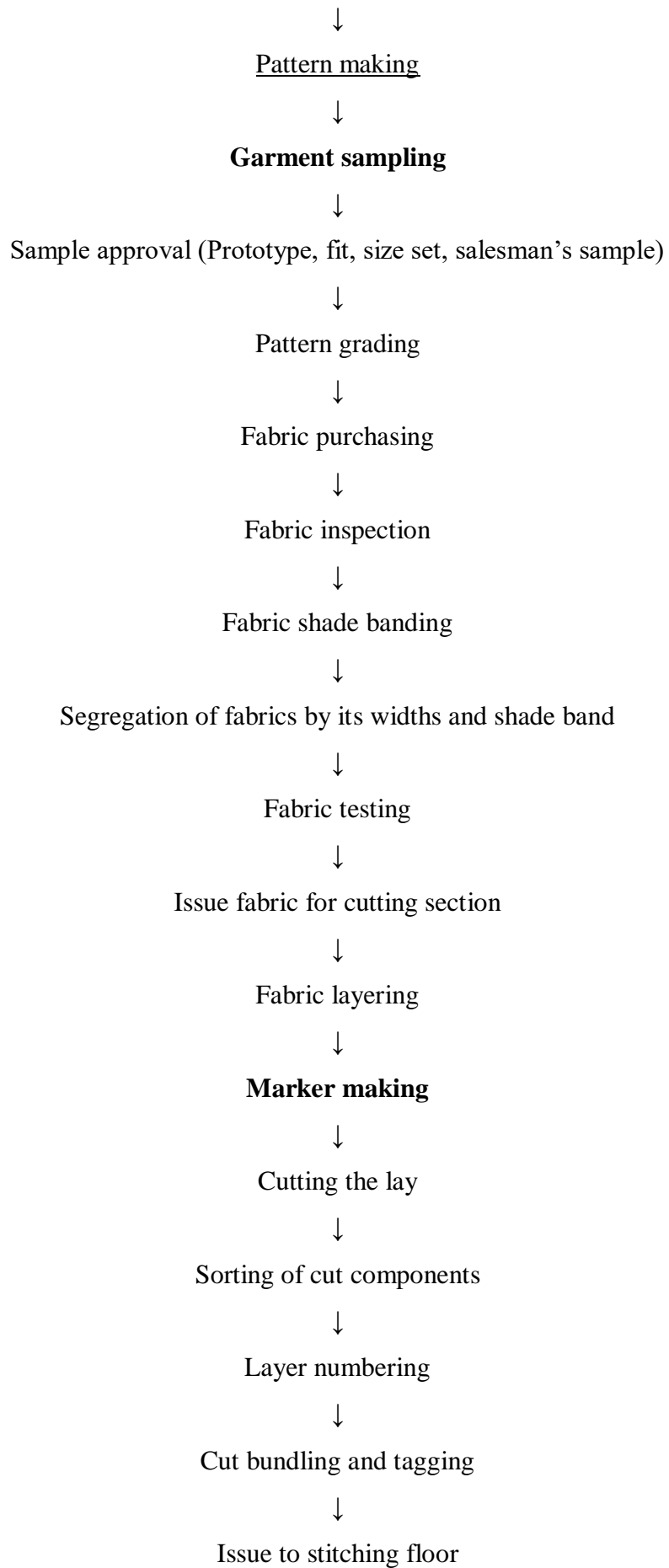
#### **7. Glitter Leggings**

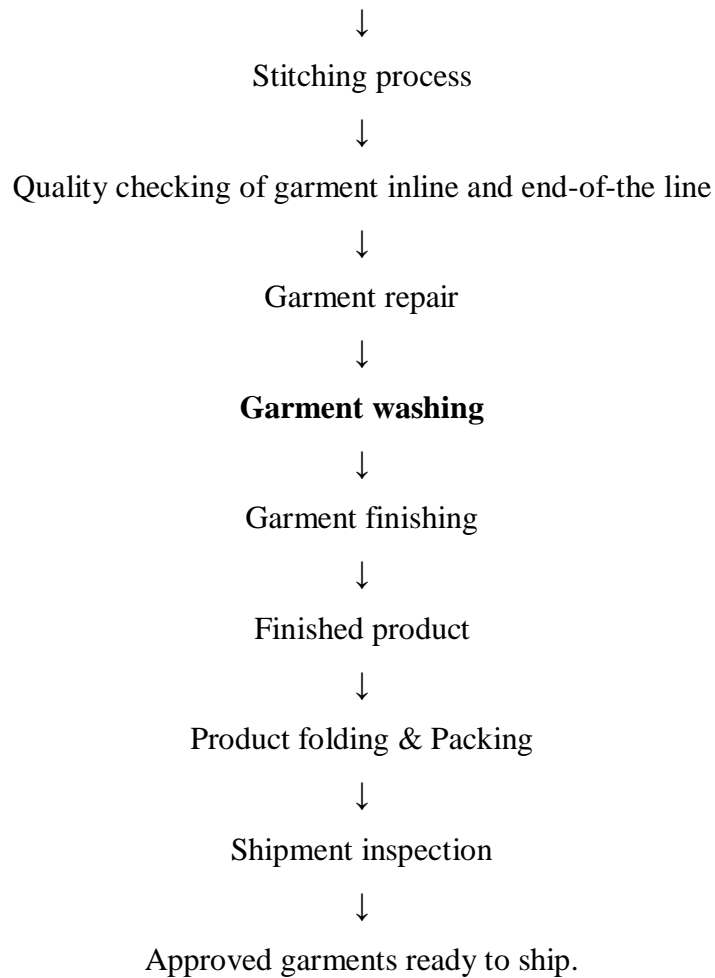
These leggings are ideal for wearing to parties as well as any other type of function. It is possible for someone to look absolutely fantastic without exposing an excessive amount of skin while yet highlighting their contours.

#### **2.2.4. Manufacturing of leggings**

##### **Flow Chart of Leggings Manufacturing Process**







### **2.2.5. Leggings leading brand in India**

Because leggings are a trend that will perpetually be in style, every woman who is concerned with fashion should have a pair of leggings in her wardrobe at all times. Because they are stretchy, lightweight, comfortable, and breathable, leggings are an excellent choice for wear during any time of year. They are versatile enough to be worn to work as well as out and about running errands. Additionally, leggings are among the articles of clothing that are the most useful that a person can own. If you're looking for a pair of leggings that are not only fashionable but also comfortable and can be worn in any situation, check out our ranking of the best leggings brands.

Stretchy to fitted cuts are just two of the many silhouettes offered by these manufacturers, and you are sure to find something in their collections that is just right for you. Leggings are the perfect example of an item that exemplifies how style and comfort can go hand in hand. If you want to look fashionable without sacrificing your comfort, one of the top leggings businesses

on this list may be the best option for you to consider. They are elastic, fun, and comfy, and they come in a wide variety of colours so that they may be worn with a wide variety of clothes.

<b>Brand</b>	<b>Year Established</b>	<b>Registered Office</b>
1. Biba	1988	New Delhi
2. Lyra	2012	Kolkata
3. Global Desi	2013	Bangalore
4. Saundarya	2016	Delhi
5. Go Colours	2010	Chennai
6. BlissClub	2020	Bengaluru
7. Dixcy Scott	–	Bengaluru
8. Rupa	1985	Kolkata
9. Globus	1998	Mumbai
10. Twin Birds	–	Tiruppur

Source: CityWitty 2022<sup>1</sup>

### **2.2.6. Health related issues with leggings**

According to Ghosh (2022), the following is a list of health problems that can arise from persons wearing leggings on a daily basis:

**1. Back pain:** It can be caused by wearing garments that are either too loose or too tight for your body. This is due to the fact that you engage in movement on a regular basis, which places additional tension on your muscles and, as a result, leads to back pain.

**2. Skin issues:** When you wear garments that are too small for you, they have a tendency to stick to your body, and this can eventually lead to a number of skin issues. Because it makes it more difficult for your skin to breathe, you may find that it causes your skin to become irritated and red. Additionally, if the clothes are made of a material that does not allow air to pass through, the condition may become even more severe.

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<sup>1</sup> <https://www.citywitty.in/best-leggings-brands-in-india/>

**3. Sweating:** Wearing clothes that are too small for you can make you sweat, which can contribute to an unpleasant body odour. In addition, if your garments are made of materials like nylon, not only do you tend to sweat more, but the other issues do as well.

**4. Blood flow:** Wearing garments that are too snug might reduce the amount of blood that flows through your body, which can eventually cause you to feel lethargic and worn out.

**5. Varicose veins:** Wearing clothes that are too tight around the body can promote poor blood circulation throughout the body, which can eventually result in the development of varicose veins.

The following difficulties have been reported to be connected with health problems with the wearing of leggings, according to Sahid (2016):

### **Chafing**

The act of causing skin irritation by rubbing against it is known as chafing. When you wear leggings or any other type of clothing that is quite snug, you need to be concerned about the friction that will be caused on your skin. Cracks on the skin's surface, dehydration of the skin, and inflammation are all side effects of chafing, which contributes to the problem. Dr. Zeichner believes that removing the "offending" chemicals is the most effective way to treat chafing. This indicates that you should take a break from wearing leggings and apply extra moisturiser to your skin.

### **Folliculitis**

Simply put, this is a fancier term for inflammation of your hair follicles, which is what it is. It is likely that you have observed a few raised red pimples on your legs. Just try to picture how uncomfortable it would be if that rash got worse. The majority of cases of folliculitis are caused by bacterial or fungal infections, and the condition will typically cure up in a matter of days if the patient practises basic self-care. This includes applying moisturiser, avoiding wearing leggings constantly, thoroughly washing the affected area, and wearing loose pants at least when they are at home. However, if you observe that the hair follicles appear to be more infected, the Mayo Clinic advises that you see a physician and apply an antibiotic cream or an antifungal ointment. Aloe vera is another option for restoring moisture to the skin, so you might want to try it.

## **Ringworm**

Any medical condition whose name includes the word "worm" carries a high level of unpleasant connotation. But try not to get too worked up about it; ringworms have absolutely nothing to do with real worms. According to Dr. Zeichner, the condition is a fungal infection that is brought on by excessive perspiration when wearing tight exercise clothing. Yes, we will eventually get to yoga pants! This infection causes a rash on the skin that is red, scaly, and occasionally irritating. The symptoms of this illness are exacerbated by activities such as yoga or wearing tight workout clothes. To get rid of ringworm, Zeichner recommends using an antifungal cream, which can be purchased over-the-counter, or going to the doctor to acquire a prescription if your case is really severe.

## **Itching**

Itching is another condition that sounds much worse than it actually is. Imagine going for a run while wearing yoga tights; this could be the perfect setting for a fungal infection to flourish and spread. It should come as no surprise that athletes and people who are overweight are more likely to experience itching than other groups of people. After a particularly steamy day, it is important to take a shower and change out of your leggings in order to avoid the terrible itch. Applying an antifungal cream that can be purchased over-the-counter is recommended treatment for athlete's foot, just as it is for ringworm.

## **Yeast infection**

The terrible yeast infection is something that many women have dealt with at some point in their lives. Yeast thrives in surroundings that are warm and moist, and your leggings give the ideal conditions for its growth. If you are experiencing itching or discharge, it is quite likely that you have a yeast infection (or, as previously mentioned, maybe BV or another illness). After making a diagnosis, a physician will recommend a therapy that is either oral or topical. No matter how beautiful your sweaty yoga pants look, you should never wear them out in public for the entire day if you want to avoid getting a yeast infection.

## **Skin dryness**

If you put on a pair of leggings without first moisturising your skin, you can find that you have a really itchy problem on your hands. In point of fact, what you think of as "dust" on your leggings is actually just dead, dry skin. Dermatitis, a rash that is red and sensitive that is caused by damage to your protective skin layer, can be brought on by very dry skin. It is simple to

prevent dry skin, but it does need a few more minutes out of your regimen. Make it a routine to moisturise your skin every day, take a shower after you work out, and change out of your wet pants as soon as possible.

### **Weight gain**

Let's be honest: when you're having a "fat" day, leggings are the perfect way to disguise a multitude of transgressions. However, they could be doing harm to your body while at the same time "hiding" supposed flaws. Leggings, according to some authorities, can cause muscles to become "lazy" and lead to the development of flabby stomachs and shaky legs. The assertion will frighten thousands of people, particularly those for whom leggings have become an essential part of their clothing. According to physiotherapist Sammy Margo, who says, "Leggings feel good and look great, and I am as addicted to them as anyone else, but there is a downside: they hold in and support the quadriceps (thigh muscles) and the core muscles in your tummy, and they do the job the muscles are supposed to do." Because of this, the muscles in your body are permitted to relax and shut down, which may cause your body to become less toned and slimline over time compared to how it would have been if you hadn't done this.

# **METHODOLOGY**

## **CHAPTER - 3**

### **METHODOLOGY**

Experimental procedure pertaining to the study on “Assessment of compression properties on wearing tight pant leggings” is discussed under the following headings:

#### **3.1. Conduct of survey**

3.1.1 Selection of sample

3.1.2. Selection of data collection

3.1.3. Preparation of questionnaire

3.1.4. Collection of data

3.1.5. Analysis of data

#### **3.2. Selection of leggings**

#### **3.3. Compression property test for leggings**

#### **3.4. Air permeability test for leggings**

#### **3.5. Evaluation of physical property the evaluation of leggings**

3.5.1. Yarn count

3.5.2. GSM

3.5.3. Course per inch

3.5.4. Wales per inch

3.5.5. Loop length test

3.5.6. Extension and Recovery test

### **3.1. Conduct of survey**

The study of the sampling of individual units from a population as well as the associated techniques of survey data collection, such as questionnaire construction and methods for improving the number and accuracy of responses to survey is the focus of the field of applied statistics known as survey methodology. Survey methodology is primarily concerned with human research surveys. The instruments and processes used in survey methodology are those that pose one or more questions and then wait for answers, which may or may not be given.

Survey questions have a significant impact on the statistical conclusions that can be drawn about the population that is the subject of the study. Researchers conduct statistical surveys with the goal of drawing statistical inferences about the population that is the subject of the study. Quantitative research is exemplified by polls about public opinion, surveys about public health, surveys about market research, surveys conducted by the government, and censuses. All of these types of surveys employ survey methodology to answer questions about a population. Censuses do not involve a "sample", but they do include other features of survey methodology, such as questionnaires, interviewers, and procedures for following up on non-response. Surveys are a valuable source of information for a wide variety of public information and research sectors, including sociology, psychology, health care provision, and marketing research, amongst others.

In the process of carrying out survey research, collect insights from a wide variety of people by interrogating them and analyzing the responses they provide to your inquiries. It is the most effective method for gathering data about the preferences, beliefs, and traits of individuals, in addition to other relevant information.

In this study, the performance characteristics of leggings that are often worn were analyzed and compared. A questionnaire was designed and distributed to a representative sample of consumers (n=251) with the goal of gaining an understanding of the characteristics that customers look for their leggings and determining the effects of wearing tight pant leggings on the body's compression levels.

### **3.1.1. Selection of sample**

The estimation of the characteristics of a population is made possible by the process of sampling, which involves directly monitoring a subset of the complete population. Researchers are not interested in the sample in and of itself; rather, they are interested in what may be learned about the full population from the sample. The definition and organization of a survey sample are two aspects that must not be overlooked. If the improper questions are asked during the survey, the data collected will not be useful in meeting the objectives of the survey. The data will not give an accurate depiction of the population if the questions are asked of the wrong persons. There will be a bias in the results.

The choice of the research sample is one of the most important aspects of the design of the study, and it can even influence the results of the investigation before it has even began. A strong study is strengthened by a good sample selection and a suitable sample size, which in turn saves significant time, money, and resources. In the context of research on healthcare, bad design could result in the implementation of potentially dangerous procedures, delays in the development of new treatments, and missed opportunities to provide high-quality care. Researchers frequently seek a compromise between the ideal sample and one that is practicable or convenient, understanding the limitations of their design selections as they do so. Although not every study can attain design perfection, there are several that can come close. While selecting samples is by no means an easy task, the following are some strategies to keep in mind as you read research in order to get the most out of your efforts and get the most accurate results possible.

In the current investigation, the researcher chose 251 sample respondents at random from among the undergraduate students at the Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore.

### **3.1.2. Selection of data collection methods**

A survey is an in-depth investigation into a particular population or set of circumstances. Interviews, surveys, experiments, and other methods are all examples of types of primary data that can be obtained by researchers directly from the primary sources themselves. Primary data are the kind of data that are acquired directly from the source where the data were first collected. Primary data are considered to be the most reliable type of data for use in research. The current research activity was carried out by the investigator as a survey using questionnaire

to collect primary data as the mode of data acquisition.

### **3.1.3. Preparation of questionnaire**

When it came time to collect primary data for the study, the researcher relied on questionnaire methods. A pilot research involving twenty students was carried out in advance of the survey. The students were given the questionnaires, and their responses along with other data were collected. The questions took a careful look at the changes that were made wherever it was determined that they were essential. A modified version of the questionnaire was then given to 251 undergraduate students at the Avinashilingam Institute for Home Science and Higher Education in Coimbatore. This was done in response to the comments and recommendations made by the respondents as well as the experts. The information was gathered in order to know Evaluation of the effects of wearing tight pants or leggings on compression properties among the respondents.

The questionnaire had seven sections, and its purpose was to collect data on the topics such as general information, the type of leggings worn, challenges encountered as a result of wearing leggings, the degree of tightness in leggings, brand names, sizes, and other leggings-related particulars. (Annexure 1)

### **3.1.4. Actual collection of data**

The undergraduate students attending Avinashilingam Institute for Home Science and Higher Education for Women were the ones who participated in the study's data collection process. The number of people in the sample was 251. The students were given the questionnaire (Plate 1), and their responses were recorded. The data thus collected were then entered into Ms. Excel in order to carry out the statistical analysis, and the laboratory was used to evaluate the findings connected to the leggings.

### **3.1.5. Analysis of data**

After the data were initially entered in Microsoft Excel, they were exported to the Statistical Package for Social Science (SPSS) so that they could be analyzed using the appropriate statistical measures. Each and every result is presented in a tabular as well as graphical format for the purpose of making the statistically significant difference more readily apparent to the reader.



**Plate 1**

**Data collection**

### **3.2. Selection of leggings**

The researcher has carried out the survey with the group that was chosen to serve as the sample, and based on the findings, they have determined that there are two brands and two styles of leggings that are most popular with the sample. Following those considerations, the following methods were applied to the research project.

The investigator, in order to carry out the current research, has selected the leggings by following the processes outlined in the following sections.

**Product classification:** Leggings are a sort of skin-tight clothes that cover the legs and can be worn by either men or women. Leggings are not gender specific. In the beginning, leggings consisted of two individual garments, one for each leg. Leggings created in the modern era are frequently constructed from a mixture of lycra, nylon, cotton, or polyester; however, they can also be constructed from other materials such as silk and wool. There is a huge variety of hues and patterns of embellishment that can be found on leggings. Leggings can be worn entirely exposed at times, but typically they are worn either partially covered by another garment such as a skirt, a large t-shirt, or shorts, or fully covered by an outer garment such as a full-length skirt. Leggings can also be worn under shorts. Leggings normally end at the ankle, and some styles have stirrups or completely enclose the wearer's feet. Some are far more concise. Leggings are used for a variety of reasons, including to keep a person's legs warm, to prevent against chafing during activities such as exercise, and as a garment for fashion or decoration. Leggings are acceptable attire for both men and women when working out, but outside of the

gym, women are more likely to be seen wearing them. In common parlance, the term “leggings” refers to form-fitting pants that are pulled up high on the waist and reach all the way down to the ankles.

There were two different types of leggings used in this research: chudidhar type leggings and ankle length leggings. Both of these lengths were worn by the participants. These two varieties were chosen since the sample study found that people most commonly preferred these two sorts of leggings.

Fabric of the leggings: viscose with elastin and cotton with elastin were selected as the fabrics of choice for this particular research project. The results of the survey allowed for the identification of these two types of cloth.

Leggings brand: for the purpose of the research, the leggings of brand X and brand Y were selected. There were two variations of the brand X leggings: one was of the chudidhar style, and the other was ankle length. The only type of fabric that made up the brand X was viscose blended with elastin. Viscose with elastin and cotton with elastin were the two types of textiles that were utilized in the production of the leggings that were selected to represent the brand Y. According on the results of the survey, these two brands were recognized.

Nomenclature of the sample leggings selected for the study in presented in table 1.

<b>Type of leggings</b>	<b>Nomenclature</b>
Chudi leggings-Cotton	CL-C
Chudi leggings-Viscose 1	CL-V1
Chudi leggings-Viscose 2	CL-V2
Ankle leggings-Cotton	AL-C
Ankle leggings-Viscose 1	AL-V1
Ankle leggings-Viscose 2	AL-V2



**Plate 2**

**Selected leggings**







**Plate 3**

**Measurement of Leggings**

**3.3. Compression property test for leggings**

The material's response to being squeezed is revealed through the use of the compressive testing method. When a material is subjected to compression testing, it is possible to ascertain its behavior or response when subjected to crushing loads, in addition to measuring the material's plastic flow behavior and ductile fracture limits. In order to accurately quantify the elastic and compressive fracture properties of brittle or low-ductility materials, compression tests are an essential part of the testing process. In addition, compression tests are utilized to ascertain the modulus of elasticity, proportional limit, compressive yield point, compressive yield strength, and compressive strength of a material. These characteristics are necessary for determining whether or not the material can be used for a particular application and whether or not it can withstand a particular stress level without breaking. The majority of the sample claimed that they were experiencing tightness in their muscles while using the leggings, which led the researchers to conclude that this particular test should be employed in the study because it was determined based on the results of the previous survey. For the purpose of the test, both

of the aforementioned types of leggings were picked. Compression test were done with the help of 3 dummy legs in different size like S, M and L. 6 leggings with 2 materials were used in dummy legs to find the compression property.

	
<p align="center"><b>Size variable dummy legs</b></p>	<p align="center"><b>Compression test for leggings</b></p>
<p align="center"><b>Plate 4</b></p> <p align="center"><b>Compression testing for leggings</b></p>	

### 3.4. Air permeability test for leggings

When attempting to understand the fundamental qualities of a fabric, those working in the textile industry frequently refer to the "air permeability" concept. Retail customers inquire about it quite regularly because it is such an important aspect of the fabric. A fabric's ability to enable air to move through it easily is referred to as its air permeability, and it can be measured in terms of how effectively it does this. This material is intended to serve as a technical description of the functional performance of clothing. Different testing circumstances can be used to an air permeability evaluation using a number of different standards that are already in existence.

The material and structural properties of a fabric have a significant impact on its air permeability. These properties include the shape and value of the pores in the fabric and the yarn, both of which are dependent on the structural parameters of the fabric. These structural parameters include the weave of the fabric, the raw material of the yarns, and the set of yarns, amongst others. In addition to the comfort of clothing, it is also crucial for a number of end-

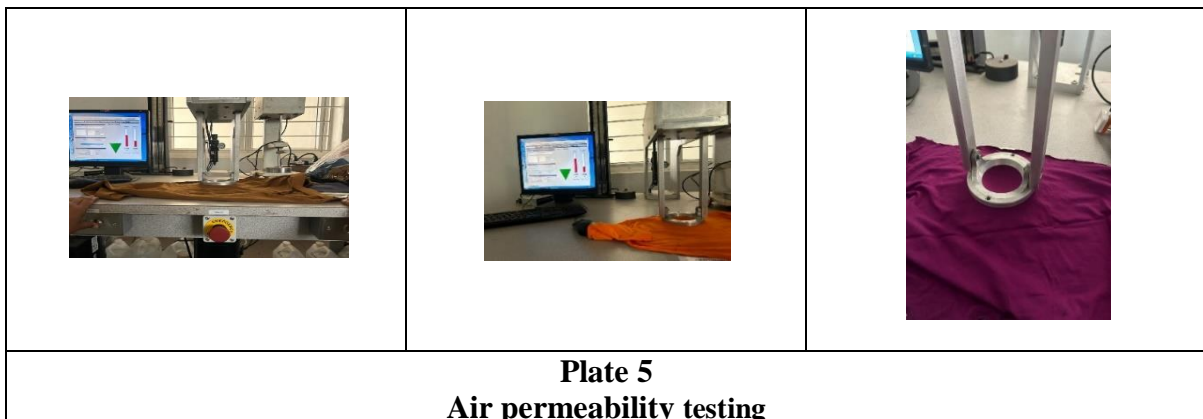
uses of fabric, such as industrial filters, tents, sail-clothes, parachutes, materials for raincoats, shirtings, down-proof fabrics, airbags, and so on.

The amount of air that can travel through a fabric despite a pressure difference of 10 millimeters of mercury per square meter per second is referred to as the material's air permeability and is measured in milliliters. The air permeability of any material can be described as the amount of air that moves at a right angle through a known area of the specimen in a unit of time while there is a prescribed air pressure differential between the two sides of a specimen.

In order to determine the degree to which the specimen is permeable to air, the amount of air that is allowed to travel perpendicularly through a certain section of the fabric in a given amount of time is modified. This is done in order to achieve a particular air pressure differential between the two sides of the samples. The air permeability of the fabric sample can be approximated with the help of this rate of air flow. This parameter has an immediate and direct effect on the comfort parameter of the cloth.

As a result of the majority of respondents to the survey stating that they struggle to stay warm in their leggings, the researcher in this study conducted an air permeability test. This test was chosen because of its applicability to the topic under investigation.

Compression test was done for all the 6 samples selected: CL-C, CL-V1, CL-V2, AL-C, AL-V1, AL-V2 (CL – Chudi leggings, AL – Ankle leggings, C – Cotton, V – Viscose).



### 3.5. Evaluation of physical properties of leggings

The static physical dimensions of a cloth are referred to as its "physical properties." In the current investigation, the investigator made an effort to evaluate the leggings' physical properties by using the following test. Physical properties (Yarn Count, GSM, Course Per Inch,

Wales Per Inch, Loop Length and Extension and Recover Test) were determined for 6 samples including.

### **3.5.1. Yarn count**

The textile business is dependent on the accurate measurement of yarn count. Without this phrase, neither the spinning mills nor the weaving mills can function properly. Because the pricing of the goods is completely dependent on it. This indicates that it is the most significant term in the textile industry. The yarn count is a numerical expression that determines the degree to which the yarn is fine or coarse. In addition, it communicates the thickness or lack of thickness of the yarn. The Textile Institute provides the following definition: "Count is a number which indicates the mass per unit length or the length per unit mass of yarn." Yarn count test as done for all the samples selected.

### **3.5.2. GSM**

The GSM test, which is a measurement of grams per square meter, is one of the most important procedures for estimating the weights of knit fabric, non-woven fabric, or paper cardboard. The test is a measurement of grams per square meter. Since woven fabric, fabric with a coating, or laminated fabric is not as typically tested using the GSM method, the customer would need to offer unique specification prior to GSM testing in order for the test to be valid. GSM method of weighting done for all the samples selected.

### **3.5.3. Course per inch**

The term "course per inch" (CPI) refers to the number of knitted fabric loops that are contained within one inch. With the use of a counting glass and a needle, the number was measured to be 5 inches. Next, we take the total number of courses and divide it by 5, which gives us the number of courses per inch. Course per inch was determined for the selected samples.

### **3.5.4. Wales per inch**

The term "wales per inch" (WPI) refers to the number of wales that are included within one inch of knitted fabric. When it comes to performing the calculation for the number of wales per inch, there are a few factors that need to be taken into consideration. To begin, it is necessary

to have an accurate measurement of the width of the fabric in inches. The second step in the calculation is to establish the desired number of wales per inch. This can be done by counting the number of millimeters in one inch. To accomplish this, simply divide the breadth of the cloth by the number of wales that are included within one inch. The final solution can be found by multiplying the number that was obtained by the total number of inches that are in a yard. Wales per inch was done with for all the selected samples.

### **3.5.5. Loop length**

The off machine fabric is used to take the measurement for the actual loop length. In most cases, the length of a loop is measured by unraveling a portion of a course or the entire course and then applying a tension to the unraveled yarn. This tension simply removes the crimp in the unraveled yarn and makes the yarn straight without causing any strain. Stitch length, also known as loop length, is the amount of yarn that must be used in order to create a full loop of knitted fabric. A length of yarn is referred to as a stitch length when it encompasses both the needle loop and half of the sinker loop on either side of it. Loop Length test was done with for all the selected samples.

### **3.5.5. Extension and recovery test**

Two-way stretching, in which the material is extended in the crosswise direction, and four-way stretching, in which the material is stretched in both directions, crosswise and lengthwise, allow stretchable fabric to be expanded in the direction that force is applied without or before breaking. The ability of some textiles to return to their original size after being stretched is referred to as recovery, whereas the inability of other materials to return to their original size after being stretched is referred to as growth. The Fabric Stretch and Recovery Tester is an instrument that measures the degree to which woven materials stretch, grow, and recover after being stretched. Extension and recovery tests was done with for all the selected samples.

# **RESULTS AND DISCUSSION**

## **CHAPTER - 4**

### **RESULTS AND DISCUSSION**

Leggings, which are a piece of skin-tight apparel that covers the legs and is meant to be worn by both men and women, have been enjoying a consistent increase in demand. Leggings enhance one's figure by hugging the skin closely and covering the legs. The vast majority of women in the world wear leggings as their primary bottoms garment. In point of fact, leggings typically come with a knitted fabric. On the other hand, leggings made of either leather or woolens are equally popular as a fashion trend. These days, leggings are available in a wide variety of hues, designs, and patterns. In addition, leggings are available in a wide range of sizes and lengths. In general, people are able to make many types of leggings out of a variety of materials such as Lycra, spandex, nylon, polyester, silk, cotton, wool, or other fabrics. These fabrics can be used to produce leggings. Leggings like these are a fashion fad, but they have certain adverse effects on the people who wear them. The research project title "assessment of compressional properties on wearing tight pant leggings":

- 4.1. Survey
- 4.2. Compression Property test for Leggings
- 4.3. Air Permeability test for Leggings
- 4.4. Evaluation of Physical properties on Leggings
  - 4.4.1. Yarn Count
  - 4.4.2. GSM
  - 4.4.3. Course per Inch
  - 4.4.4. Wale per Inch
  - 4.4.5. Loop Length
  - 4.4.6. Extension and Recovery test

### Socio-Demographic Variables

The findings of socio-demographic characteristics of the respondents who were chosen as the sample are presented in Table 1.

Variables		Frequency	Percentage
Age (In Years)	Below 20	194	77.3
	21 – 25	56	22.3
	Above 26	1	0.4
Educational Qualification	UG	202	80.5
	PG	49	19.5

**Table – 1**

### Socio-Demographic Variables

According to the Table 1 approximately 77.3 of the respondents who were chosen percent were under the age of 20 years, 22.3 percent were between the ages of 21 and 25 years, and 0.4 percent were over the age of 26 years. The sample has 80.5 percent of students who were enrolled in undergraduate programs, and 19.5 percent of students who were enrolled in post graduate or professional programs. It can be deduced from the socio-demographic features of the sample that the research was conducted among members of the younger generation. The participants in the sample ranged in age from 18 to 26 years old and were students at one of two educational levels: either undergraduate or graduate. Because the vast majority of people who are under the age of twenty-five (UG) believe it fashionable to wear leggings, this age group in particular was selected as the focus of the research work.

### Type of leggings chosen

The results of the study are summarized in table 2, which includes information regarding the specifics of the leggings that were most chosen by the sample.

Variables		Frequency	Percentage
Type of leggings chosen	Chudi Leggings	205	81.7
	Ankle Length Leggings	44	17.5
	Knee Length Leggings	1	0.4
	Mid – Calf Length	1	0.4

**Table – 2**

### Details on Leggings

From table 2, it is evited that presented nearly 81.7 percent of the students in the sample group preferred chudi leggings for their use, while 17.5 percent of the students were wearing ankle length leggings, and very few students were found to wore knee length leggings or mid-calf length leggings made up a very small percentage of the sample. As most of the respondent preferred chudi length leggings over other forms of leggings, despite the fact that there are various kinds of leggings are chose in the market today, chudi length leggings was selected for the present considered study. Along with chudi length leggings, the ankle length leggings preferred by the sample were also taken for the study. This is because, as of late, even ankle length leggings have become popular among students in terms of fashion.

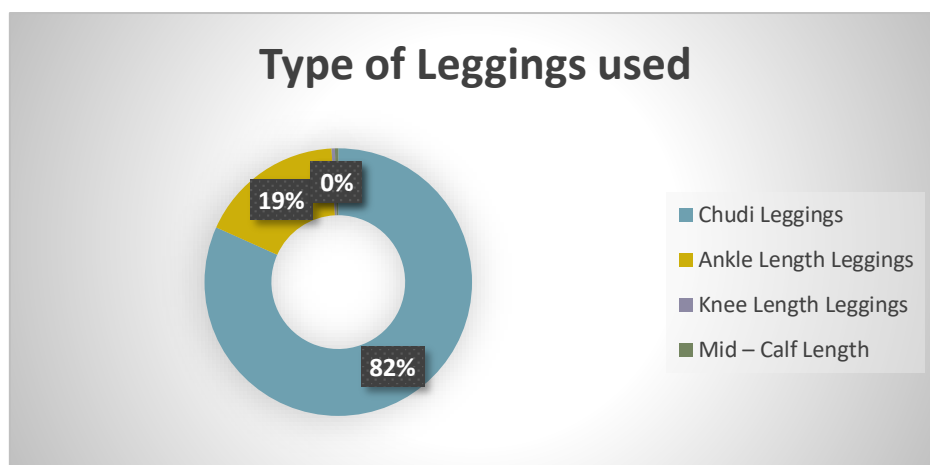


Figure – 1

### Type of Leggings used

### Problems with usage of leggings

The issues that arise when wearing leggings among the population included in the sample are outlined in the Table 3.

	Variables	Frequency	Percentage
Chudi Legging	Over Heat Feel	101	40.2
	Swelling	14	5.6
	Skin Itching	36	14.3
	Itching and Soreness	4	1.6
	Folliculitis	7	2.7
	Pressure marks	10	4.0
	Skin Irritation	1	0.4

	Skin Dryness	4	1.6
	Red marks on the skin	2	0.8
	NA	72	28.7
Ankle Legging	Over heat feel	30	12.0
	Swelling	10	4.0
	Skin itching	18	7.2
	Itching and soreness	4	1.6
	Folliculitis	3	1.2
	Pressure marks	7	2.8
	Skin irritation	4	1.6
	Ringworm	2	0.8
	Skin dryness	8	3.2
	Restricted movements	1	0.4
	NA	164	65.3
Knee Length Leggings	Over heat feel	4	1.6
	Swelling	3	1.2
	Skin itching	1	0.4
	Itching and soreness	1	0.4
	Skin irritation	1	0.4
	Ringworm	1	0.4
	Skin dryness	1	0.4
	NA	239	95.2
Mid-Calf	Over heat feel	2	0.8
	Swelling	1	0.4
	Skin itching	2	0.8
	Skin irritation	3	0.4
	Skin dryness	1	0.4
	Red marks on the skin	1	0.4
	Restricted movements	1	0.4
	NA	240	95.6

**Table – 3**

**Problems of using Leggings**

Overheating was the primary issue that the sample had with the chudi leggings, as this was reported by 40.2 percent of the sample. The same was discovered for the ankle leggings, as this was reported by 12 percent of the sample. In contrast, respondents for the knee length leggings and the mid-calf length leggings were insignificant, so the researcher chose only the chudi length leggings and the ankle length leggings for the study. Furthermore, the majority of respondents reported that heating was an issue when wearing their leggings, and this may be due to the length of the leggings they wore.

**Frequency of usage**

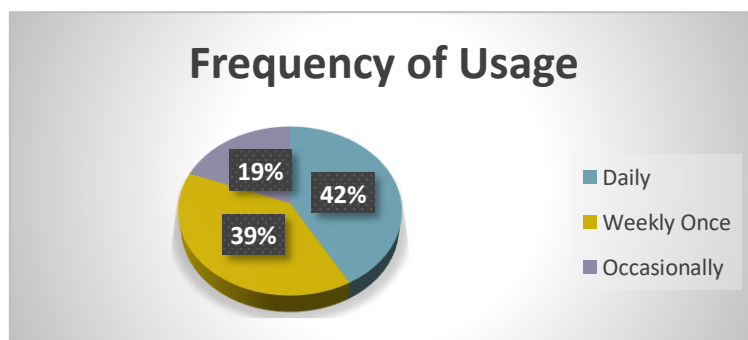
It was determined how frequently the respondents in the sample wore leggings, and the findings are presented in Table 11.

Variable	Frequency	Percentage
Daily	105	41.8
Weekly Once	98	39.0
Occasionally	48	19.1

**Table –11**

**Frequency of usage**

Leggings were worn by about 41.8% of respondents on a daily basis as an alternative for everyday wear. In contrast, 39% of respondents claimed that they prefer wearing leggings weekly once, and 19.1% of respondents stated that they prefer wearing leggings rarely. According to the findings, it was determined that the majority of the respondents in the sample group favor leggings as their usual wear because it is one of the fashion statements among the younger generation in the contemporary day.



**Figure – 4**

**Frequency of Usage**

### Frequency of leggings usage

The researcher used an ANOVA to try to determine whether or not there was a correlation between the sample's level of usage and the types of problems they had. The results of this investigation are presented in Table 4.

Variables		Mean	SD	SE	F-Value	.Sig
Chudi	Daily	5.54	5.11	0.50	24.650	.000**
	Weekly Once	5.09	5.15	0.52		
	Occasionally	5.83	5.48	0.79		
Ankle	Daily	10.39	5.27	0.51	31.994	.000**
	Weekly Once	10.14	5.42	0.55		
	Occasionally	11.35	4.82	0.70		
Knee Length	Daily	11.70	1.74	0.17	12.252	.036*
	Weekly Once	11.47	2.19	0.22		
	Occasionally	11.71	1.61	0.23		
Mid Calf	Daily	13.64	2.12	0.21	3.568	.328 <sup>NS</sup>
	Weekly Once	13.66	1.67	0.17		
	Occasionally	13.79	1.01	0.15		

\*\*=Significant at 1% level

**Table – 4**

### Frequency of leggings usage

There is a significant association between the frequency of usage, such as daily, weekly once, and occasionally, and chudi length leggings and ankle length leggings at 1 percent level of significance. There is also an association between the frequency of usage and knee length leggings, as the variable was significant at 5 percent level of significance. However, there was no significant association between the frequency of usage and mid-calf length leggings. Therefore, only chudi length leggings and ankle length leggings were included in the research since the researcher noticed that these lengths had a significant association with the frequency among the sample.

### Feeling of tightness

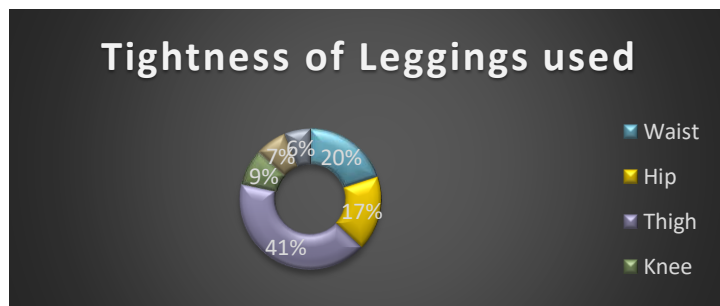
A study was conducted on the tightness of the leggings that the respondents feel, and the findings are summarized in Table 5.

Variables	Frequency	Percentage
Waist	50	19.9
Hip	43	17.1
Thigh	104	41.4
Knee	21	8.4
Calf	18	7.2
Ankle	15	6.0

**Table –5**

**Feeling of Tightness**

According to the data presented in Table 5, the majority of respondents (41,4 percent) experienced tightness in the thigh region, followed by 19.9 percent of respondents who reported experiencing tension in the waist region, and 17.1 percent of respondents who had stiffness in the hip region. Some people complained of discomfort in the region of their knees, calves, and ankles. From result, it was discovered that although vast majority of respondents favored using leggings as daily wear, many of them had tightness in the hip and waist area as a result of the waist band, which caused their comfort wear to become disrupted.



**Figure – 2**

**Tightness of Leggings used**

**Association between Frequent usage of Leggings and Tightness**

The researcher has conducted an investigation to determine whether there is a correlation between the frequent use of leggings and the tightness for which ANOVA was utilized, and the data are presented in the following Table 6.

Variable	Mean	SD	SE	F-Value	.Sig
Daily	3.00	1.43	.14	6.656	.000**
Weekly Once	2.63	1.26	.13		
Occasionally	2.90	1.40	.20		

\*\*=Significant at 1% level

**Table – 6**

**Association between Frequent usage of Leggings and Tightness**

According to the findings of the ANOVA, there is a significant relationship between the regular wearing of leggings and a feeling of tightness among the sample respondents. These findings are statistically significant at 1% level, indicating that there is a link between the two. The results conclude that there is a correlation between the frequency of wearing leggings, namely on a daily, weekly, or occasional basis, and the tightness of the leggings.

### Size of leggings used

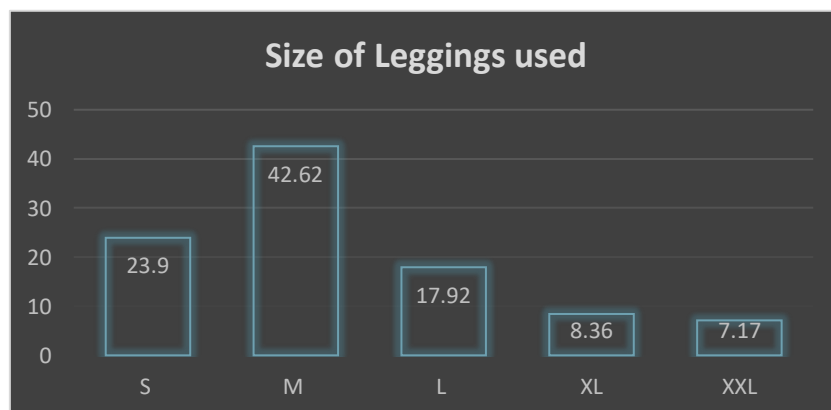
The degree of tightness of the leggings worn by the respondents in the sample was analyzed, and the results are presented in the Table 7.

Variables	Frequency	Percentage
S	60	23.90
M	107	42.62
L	45	17.92
XL	21	8.36
XXL	18	7.17

**Table –7**

### Size of Leggings used

It has been observed that the majority of the sample respondents (43.62 percent) have their size classified as medium. This was followed by 23.90 respondents who fall into the category of sample size S . The remaining respondents lie between the sizes of Large (17.9 percent), Extra-Large (8.36 percent) and Extra extra-large (7.17 percent). Hence the researcher has decided to carry out the present research work using the same category because the study found that the bulk of the sample came from medium-sized organizations.



**Figure – 3**

### Size of Leggings Used

### **Brand Name**

The names of the leggings brands that were worn by the respondents in the sample are listed in Table 8.

<b>Variables</b>	<b>Frequency</b>	<b>Percentage</b>
Twin Birds	141	56.2
Go Colours	29	11.6
Lyra Lux	15	6.0
W for Women	2	0.8
Dixcy Scott	1	0.4
Melango by Lifestyle	6	2.4
Prisma	55	21.9
Biba	2	0.8

**Table – 8**

### **Brand Name**

According to the results obtained (Table-8), it is clear that the sample population utilizes approximately 19 different brands of leggings, including twin birds, go colors, lyra lux, w for women, dixcy Scott, meal go by lifestyle, Prisma, and biba. 56.2 percent of the sample preferred twin birds brand, while 21.9 percent prefers the Prisma brand. As a result of these data, it can be deduced that the vast majority of people in the sample have a preference for leggings that are a combination of twin birds and Prisma.

### **Height Measurement from waist to ankle**

In the study, participants' height was measured from their waist to their ankles and measurements observed are presents in Table 9.

<b>Variable Height (cm)</b>	<b>Frequency</b>	<b>Percentage</b>
60-80	9	3.6
80-100	234	93.2
Above 100	8	3.2

**Table – 9**

### **Height Measurement from waist to ankle**

According to the data presented in Table above, approximately 93.2 percent of the sample height fell between 80 and 109 centimeters, while the remaining heights fell between 60 and 80 centimeters and above 100 centimeters. This indicated that the majority of the respondents had an average height of between 80 and 100 centimeters.

### Leg Measurement

The findings relating to the leg measurements of the sample respondents are presented in Table 10.

Variables		Frequency	Percentage
Waist (cm)	Below 70	88	35.1
	70-90	147	58.6
	90-100	12	4.8
	Above 100	4	1.6
Hip (cm)	Below 70	3	1.2
	70-90	119	47.4
	90-100	76	30.3
	Above 100	53	21.1
Thigh (cm)	Below 30	1	0.4
	30-50	169	67.3
	50-70	81	32.3
Calf (cm)	Below 15	1	0.4
	15-30	44	17.5
	30-45	205	81.7
	Above 45	1	0.4
Ankle (cm)	Below 20	32	12.7
	20-40	218	86.9
	40-60	1	0.4

**Table – 10**

### Leg Measurement

According to the information that was provided in Table 10 that was located just above this one, about 93.2 percent of the sample height fell between 80 and 109 centimeters, while the remaining heights fell between 60 and 80 centimeters and above 100 centimeters. This

suggested that the bulk of the respondents had a height that fell anywhere between 80 and 100 centimeters on the average.

The findings that pertain to the leg measures of the respondents who made up the sample are reported in the table that can be found further down the page.

### **Preference to wear leggings**

The preference for wearing leggings among the respondents in the sample was detected, and the results are presented in Table 12.

<b>Variable</b>	<b>Frequency</b>	<b>Percentage</b>
Comfortable wear for travelling	147	58.6
Business casual work environment	1	0.4
Professional business environment	2	0.8
Comfortable for working	19	7.6
Good outfitting	67	26.7
Attending class	15	6.0

**Table –12**

### **Preference to wear leggings**

According to the data presented Table 12, approximately 58.6 percent favored wearing leggings because it provided them comfort while traveling. Further 26.7 percent of them favored leggings because they provided them with a good out fitting, and the remaining individuals reported that they favor leggings for attending classes, professional business environments, and business casual work environments. It can be concluded that the majority of the people in the sample agreed that wearing leggings makes them feel more comfortable when traveling a good choice as an outfit. Leggings are becoming increasingly important in the fashion business as a means of providing the most comfortable outfits.

### **Preference of Material**

The following Table 13 provides information regarding the preferences of the sample group's members for the preference of materials for leggings.

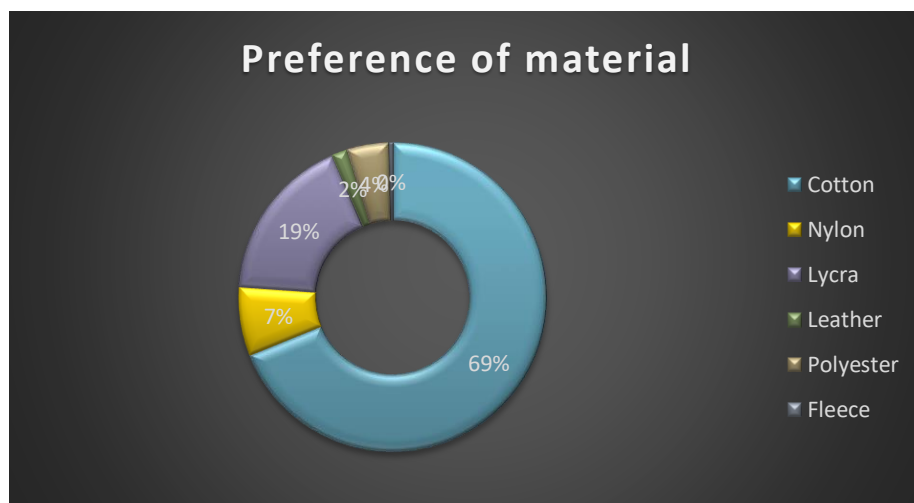
<b>Variable</b>	<b>Frequency</b>	<b>Percentage</b>
Cotton	173	68.9
Nylon	18	7.2
Lycra	44	17.5
Leather	4	1.6
Polyester	11	4.4

Fleece	1	0.4
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**Table –13**

**Preference of Material**

Approximately 68.9 percent of the sample preference leggings to be made of cotton, while 17.5 percent opted for leggings made of Lycra. Other types of textiles such as nylon, leather, polyester, and fleece were also mentioned by few respondents. Based on the findings, it was noted that the majority of the sample population desired leggings to be made of cotton since this particular fabric provides them with a comfortable feel and a nice wearing sensation.



**Figure – 5**

**Preference of material**

**Compression property test for Leggings**

The compression test is one of the most common tests used in instrumental texture evaluation. A sample is first placed on a flat base or surface, and then a flat probe or platen is lowered onto the sample with a specific amount of force or distance (alternatively, the sample is compressed to a certain percentage of its original height). This is the simplest approach. After the sample has been distorted, the degree to which it has been deformed and/or the amount of resistance it has offered are recorded. Tests of simple compression are typically referred to as uniaxial compression, which indicates that the sample is only squeezed in one direction while remaining unconstrained in the other two directions. It is possible to select either a low or a high degree of compression; however, selecting a high degree of compression will typically result in the product rupturing, spreading, fracturing, or breaking apart into fragments.

The strength, quality, or performance of components, as well as the compressive qualities of materials and completed products, can all be guaranteed through the use of compression testing

in a wide variety of different types of businesses. Tests of compression offer objective quantitative data on the integrity and safety of materials, components, and manufactured goods. This helps determine whether or not the items are suitable for their application and will not fail during storage, handling, transportation, or usage of the product.

Compression leggings are tight-fitting leggings that are typically constructed from stretch knit fabrics such as elastane. These leggings are known for their compression properties. Leggings made from this type of fabric are able to stretch without altering their overall form, making them ideal for active wear. Due to the fact that they fit extremely closely to the skin and are quite flexible, they are also known as tights.

The table that follows offers information regarding the compression quality of leggings, broken down by size from small to medium to big. It has been noticed for the two different kinds of leggings that have been chosen, which are ankle length and chudi type, as well as for the fabrics cotton with elastin and viscose with elastin. The findings were rewarded based on the dummy leg circumference, the legging circumference, and the minimum maximum range.

### Small Size

The investigator started off by looking into the compression test for leggings in smaller sizes.

Sample Dummy leg points		Dummy Leg Circumference (cm)	Legging Circumference (cm)	Min (mmHg)	Max (mmHg)	Range	Average
CL-C	B-Ankle	22	22	4.9	6.3	4.9 - 6.3	5.43
	C-Calf	33.5	24	4.5	4.7	4.5 - 4.7	4.57
	G-Above Thigh	49	50	0.0	1.9	0 - 1.9	0.73
AL-C	B-Ankle	22	19	4.1	9.8	4.1 - 9.8	7.47
	C-Calf	33.5	24	6.0	7.1	6 - 7.1	6.47
	G-Above Thigh	49	50	0.0	2.0	0 - 2	0.67
CL-V1	B-Ankle	22	18	4.6	6.7	4.6 - 6.7	5.90
	C-Calf	33.5	21	2.8	5.9	2.8 - 5.9	4.80
	G-Above Thigh	49	50	0.2	1.4	0.2 - 1.4	0.93
AL-V1	B-Ankle	22	18	5.8	6.6	5.8 - 6.6	6.23
	C-Calf	33.5	28	4.2	5.5	4.2 - 5.5	5.07
	G-Above Thigh	49	48	0.5	0.6	0.5 - 0.6	0.57
CL-V2	B-Ankle	22	20	2.4	4.7	2.4 - 4.7	3.43
	C-Calf	33.5	21	4.2	6.5	4.2 - 6.5	5.10
	G-Above	49	44	0.3	4.3	0.3 - 4.3	1.67

	Thigh						
AL-V2	B-Ankle	22	19	4.6	4.9	4.6 - 4.9	4.73
	C-Calf	33.5	24	2.4	3.2	2.4 - 3.2	2.93
	G-Above Thigh	49	48	0.0	0.2	0 - 0.2	0.07

**Table – 14**

**Small Dummy leg**

It was found that the chudidar length leggings with a cotton finish showed that for ankle the dummy leg circumference was 22, whereas the leggings circumference was 22. This information may be found in the table. In addition to this, it was found that the lowest possible value was 4.9, the highest possible value was 6.3, and that the range was somewhere between 4.9 and 6.3. In the end, it was found out that the number, when calculated as the average of all of the leggings, was 5.43. Cotton chudidar-length leggings had a calf circumference of 33.5 centimeters on the dummy, but the leggings themselves were only 24 centimeters in length. This was because the leggings were shorter than the dummy. The leggings had a value between 4.5 and 4.7, with 4.5 being the least and 4.7 the maximum. The leggings received an average score of 4.57 out of a possible 4.5 to 4.7 stars, with 4.5 serving as the middle point. The lowest possible score was a 4.5, and the highest possible score was a 4.7. It was discovered that the value for the same might fall anywhere between 4.5 and 4.7, and that 0.73 was the value that represented the mean. The thigh chudidar length cotton legging dummy leg measured a circumference of 49, whereas the leggings measured a circumference of 50.

Leggings made of cotton that were ankle length and revealed that the dummy leg circumference measured 22cm, the legging leg circumference measured 19, and the minimum range measured 4.1cm revealed that the dummy leg circumference was significantly larger than the legging leg circumference. The value 9.8 represented the maximum conceivable range, while 7.47 was found to be the value that best represented the average. The specifics of the calves revealed that the circumference of the dummy leg was 33.5, while the circumference of the leggings was 24. The range was found to be between 6 and 7.1, with 6.47 serving as the average for the range. The calf specifications of the leggings revealed that the ankle length of the leggings was 24, which demonstrated that the diameter of the leggings was 24. When taking measurements above the thigh, the cotton leggings were employed. These leggings were ankle length, and they were made. The results of these measurements showed that the diameter of the dummy leg was 49, while the circumference of the leggings was 50. The numbers 0 to 2 constituted the conceivable value range, and a value of 0.67 was determined to be the average.

According to the results of the measurements taken around the ankle, the diameter of the dummy leg was 22, while the circumference of the leggings was 18. For the chudidar-length leggings that were produced from viscose fabric, the values ranged from 4.6 to 6.7, with 5.90 being the number that was most commonly found. The measurements for the calf that were taken utilizing chudidar length leggings that were manufactured of viscose fabric revealed that the dummy leg circumference was 33.5, but the leggings circumference was 21. The scores ranged from 2.8 to 6.9, with 4.80 representing the mean value. The measurements that were taken with the viscose chudidar leggings revealed that the above-thigh dummy had a diameter of 49 centimeters, while the leggings circumference was 0.2 millimeters. These values varied from 0.2 to 1.4, with 0.93 serving as the average across the board.

According to the measurements taken on the viscose leggings that were ankle length, the dummy's ankle circumference was 22, while the leggings diameter was only 18. The scores varied from 5.8 to 6.6, with 6.23 serving as the mean for the group. The leg circumference of the calf dummy, on the other hand, measured 33.5. The leggings had a circumference of 28, a range that went from 4.2 to 5.5, and above thigh an average range that was 0.57.

In order to get accurate measurements of the ankles, we used chudidar-length leggings made of viscose cloth. According to the findings, the fake leg had an ankle circumference of 22, while the leggings only had a diameter of 20. The scores ranged from 2.4 to 4.7, with 3.43 serving as the mean value. In accordance with the particulars of the calf measurements, the diameter of the dummy leg was found to be 33.5. The dummy leg circumference was 49, while the leggings had a circumference of 44, with a range of 0.3 to 4.3 and an average of 1.67. The leggings had a circumference of 21, with a range of 4.2 to 6.5 and an average of 5.10; the leggings had a circumference of 44, with a range of 0.3 to 4.3 and an average of 1.67. According to the measurements taken of the dummy's thighs, the dummy leg had a circumference of 49. The dummy leg centimeter was 22, but the leggings circumference was 19, with a range of 4.5 to 4.9 and an average of 4.63. These findings were discovered after measurements were taken of ankle length leggings made of viscose fabric. The leg circumference of the calf dummy, on the other hand, measured 33.5. Leggings with a circumference of 24 inches, a range of 2.4 to 3.2 inches in circumference, and 2.93 inches as the average circumference were purchased. The above measurements of the thighs revealed that the dummy leg had a circumference of 4i, while the leggings had a circumference of 48. These measurements were obtained of the upper thighs. The range of values for the measurements was from 9 to 0.2, with 0.07 serving as the mean.

**Medium Size**

Sample		Dummy Leg Circumference (cm)	Legging Circumference (cm)	Min (mmHg)	Max (mmHg)	Range	Average
CL-C	B-Ankle	24	22	8.8	8.9	8.8 - 8.9	8.87
	C-Calf	37.5	24	6.8	7.4	6.8 - 7.4	7.13
	G-Above Thigh	55	50	3.4	4.4	3.4 - 4.4	4.07
AL-C	B-Ankle	24	19	11.8	12.6	11.8 - 12.6	12.17
	C-Calf	37.5	24	5.8	8.7	5.8 - 8.7	7.67
	G-Above Thigh	55	50	0.3	1.0	0.3 - 1	0.67
CL-V1	B-Ankle	24	18	5.6	8.6	5.6 - 8.6	6.60
	C-Calf	37.5	21	4.7	7.4	4.7 - 7.4	5.60
	G-Above Thigh	55	50	0.5	4.1	0.5 - 4.1	1.70
AL-V1	B-Ankle	24	18	8.4	10.2	8.4 - 10.2	9.10
	C-Calf	37.5	28	6.8	10.2	6.8 - 10.2	7.97
	G-Above Thigh	55	48	2.3	3.9	2.3 - 3.9	3.07
CL-V2	B-Ankle	24	20	6.2	7.2	6.2 - 7.2	6.70
	C-Calf	37.5	21	5.5	5.6	5.5 - 5.6	5.53
	G-Above Thigh	55	44	1.1	1.5	1.1 - 1.5	1.30
AL-V2	B-Ankle	24	19	7.2	7.6	7.2 - 7.6	7.40
	C-Calf	37.5	24	4.6	5.5	4.6 - 5.5	5.20
	G-Above Thigh	55	48	0.4	0.6	0.4 - 0.6	0.50

CL – Chudi Length, AL – Ankle Length, C-Cotton, V-Viscose

**Table – 15**  
**Medium Dummy leg**

The results of the compression test that were performed on the leggings in the size medium were examined, and the findings are provided in the table that is presented in the next paragraph.

The ankle circumference for the dummy leg was measured to be 24, while the leggings circumference was measured to be 22. The range for the chudidhar length leggings made with cotton fabric was 8.8 to 8.9, and the average was 8.87. After taking measurements of the calf, it was determined that the circumference of the dummy leg was 37.5, while the circumference of the leggings was 24. The range ranged from 6.1 to 7.4, and the average was 7.13; for the area above the thigh, the dummy's measures were 55, and the leggings circumference was 50. The range was from 3.4 to 4.3, and the average was 4.07 out of 5 possible points.

The measurements that were taken of the cotton leggings that were ankle length and manufactured of a dummy revealed that the dummy ankle circumference was 24, while the leggings circumference was 19, the range was 11.8 to 12.6 and the average was 12.17. On the other hand, the calf dummy had a girth of 37.5 inches. The dummy leg had a circumference of 55, with a range of 0.3 to 1 and an average of 0.67. The leggings had a circumference of 23, with a range of 5.1 to 8.7 and an average of 7.67. For the area above the thigh, the leggings had a circumference of 59.

In relation to the ankle, the dummy leg had a diameter of 24, whereas the leggings had a circumference of 18. The scores ranged from 5.6 to 8.6, with 5.60 serving as the mean. The circumference of the dummy leg was 55, but the circumference of the leggings was only 50. This measurement refers to the area above the thigh. The scores ranged from 9.5 to 4.1, with 1.70 being the mean value. Viscose was the material that was used to make the leggings.

The leg circumference of a dummy that was dressed in viscose leggings that reached the ankle revealed a measurement of 24 inches when the dummy was subjected to measurements. According to the measurements, the dummy leg had a circumference of 37.5, but the pants had a circumference of 18, with a range of 8.4 to 19.2 and an average of 9.10 for the circumference measurement. The diameter of the leggings was 48, the range was 2.3 to 3.9, and the average was 3.07, and the measurements of the thighs that were taken earlier revealed that the circumference of the false leg was 55. The circumference of the leggings was 48 inches, the range was 2.3 to 3.9 inches, and 3.07 inches was the average. In addition, the dummy leg circumference was found to be 55 based on the measurements taken of the thighs.

After taking measurements at the ankle, it was determined that the circumference of the dummy leg was 24, the circumference of the leggings was 29, the range was to 6.2 to 7.2, and the 6 was 6.70. Viscose was both the material and the brand of the chudidhar-length leggings that belonged

to brand 2, and the material was viscose. The calf circumference on the dummy leg measured out to be 37.5 cm when it was measured. The circumference of the leggings was 21, the range for that measurement was 5.5 to 5.6, and 5.53 was the average of those two numbers. The measurements of the thighs that were shown before indicated that the dummy had a leg circumference of 54, while the leggings had a circumference of only 43. The scores ranged from 1.1 to 1.5, with 1.30 being the mean value.

The ankle measurements for the ankle length leggings made of viscose by brand Y revealed that the dummy leg circumference was 24 inches. 20 was the value for the circumference of the leggings. the range was found to be between 7.2 and 7.6, and the average was 7.40 for the calf; the dummy had a circumference of 37.5 inches, and the leggings had a circumference of 5.5 inches; the range was between 4.6 and 5.5 inches, and the average was 5.20; and the above-the-knee measurement showed that the dummy had a circumference of 55 inches; the range was between 4.2 and 5.5 inches, and the average was 5. The leggings had a circumference of 48 inches, with a range of 9.4 to 9.5 inches and a value of 0.50 for the average. There was also a range of 9.4 to 9.5 inches.

### Large Size

Sample		Dummy Leg Circumference (cm)	Legging Circumference (cm)	Min (mmHg)	Max (mmHg)	Range	Average
CL-C	B-Ankle	28	22	11.9	12.9	11.9 - 12.9	12.43
	C-Calf	42	24	10.9	11.8	10.9 - 11.8	11.27
	G-Above Thigh	60.5	50	3.7	5.8	3.7 - 5.8	4.70
AL-C	B-Ankle	28	19	14.2	15.1	14.2 - 15.1	14.70
	C-Calf	42	24	13.1	13.9	13.1 - 13.9	13.60
	G-Above Thigh	60.5	50	1.8	4.1	1.8 - 4.1	3.00
CL-V1	B-Ankle	28	18	8.8	9.5	8.8 - 9.5	9.07
	C-Calf	42	21	7.2	7.6	7.2 - 7.6	7.40
	G-Above Thigh	60.5	50	3.0	6.1	3 - 6.1	4.70
AL-V1	B-Ankle	28	18	11.3	12.9	11.3 - 12.9	11.83
	C-Calf	42	28	7.2	10.7	7.2 - 10.7	9.50

	G-Above Thigh	60.5	48	11.9	12.9	11.9 - 12.9	12.43
CL-V2	B-Ankle	28	20	10.9	11.8	10.9 - 11.8	11.27
	C-Calf	42	21	3.7	5.8	3.7 - 5.8	4.70
	G-Above Thigh	60.5	44	14.2	15.1	14.2 - 15.1	14.70
AL-V2	B-Ankle	28	19	13.1	13.9	13.1 - 13.9	13.60
	C-Calf	42	24	1.8	4.1	1.8 - 4.1	3.00
	G-Above Thigh	60.5	48	8.8	9.5	8.8 - 9.5	9.07

CL – Chudi Length, AL – Ankle Length, C-Cotton, V-Viscose

**Table – 16**  
**Large Dummy leg**

The results of the compression test for the leggings in the large size were analyzed, and the conclusions are presented in the table below.

The ankle measures of the dummy had a circumference of 28, while the leggings had a circumference of 22. The range was 11.9 to 12.9, and the average was 12.43 for the chudidar length cotton leggings. It was determined from the calf value that the dummy leg circumference was 42. The circumference of the leggings was 24, the range was 10.0 to 11.8, and 11.27 was the average. The dummy's circumference was determined to be 69.5 based on the measurement taken around the thighs. The circumference of the leggings was fifty. The scores ranged from 3.7 to 5.8, with 4.70 being the average.

The leggings were made of cotton and were ankle length. The dummy leg had a circumference of 28 inches, but the leggings had a circumference of 19 inches. The leggings' circumference ranged from 14.2 to 15.1 inches, and the average was 14.70 inches. According to the calf measures, the dummy leg had a circumference of 4 inches, while the leggings had a circumference of 24 inches; the range was 13.1 to 13.9 inches, and the average was 13.69 inches. For the area above the thigh, the dummy leg measured 60.5 inches. The circumference of the leggings was 50, and the possible values ranged from 1.8 to 4.1, with 3.00 being the average.

For the brand X chudidar length leggings made of viscose fabric, the ankle measurements revealed that the diameter of the dummy leg was 28, while the circumference of the leggings was 18. The range was 8.8 to 9.5, and the average was 9.07. The dummy leg had a

circumference of 21 inches at the calf, with a range of 7.2 to 7.6 inches and an average of 7.40 inches. The dummy leg had a circumference of 60.5 inches at the above-thigh region, whereas the leggings had a circumference of 50 inches. The findings showed that the range ranged from 3 to 6.2, with 4.70 being the average.

The dummy leg circumference for ankle was 28 and the leggings circumference was 18. The range was determined to be between 11.3 and 12.9 and the average was 11.83 for the ankle length leggings made of viscose for brand X. The measurements of the calves revealed that the dummy leg circumference was 42, while the circumference of the leggings was 28. The range was from 7.2 to 19.7, and the average was 9.50. The dummy leg circumference was 60.5 for the sample that was taken above the thigh. The circumference of the leggings was 48, and it ranged from 11.9 to 22.9, with 12.43 being the average.

For the chudidhar length leggings made of viscose fabric for the brand Y, the dummy circumference for the ankle was 28 and the leggings circumference was 20. The range was 10.9 to 22.8 and the average was 11.27. Next came the calf measurements, in which the dummy leg circumference was 42 and the leggings circumference was 22. The range was 3.7 to 5.8 and the average was 4.70. Finally, for the measurements taken above the t The average circumference of the leggings was 14.70 inches, with a range that went from 24.2 to 15.1 cm.

The ankle measurements for the ankle length leggings made of viscose fabric for brand Y showed that the dummy leg circumference was 28, while the leggings circumference was 19. The range was 13.1 to 13.9 and the average was 13.60. The measurements for the calf were as follows: the dummy leg circumference was 42, the leggings circumference was 24, the range was 1.8 to 4.1, and the average was 3.00. The above thigh measurements were as follows: the dummy leg diameter was 60.5, the leggings circumference was 48, the range was 8.8 to 9.5, and the average was 9.07.

The circumference test for the selected fabric, sizes, and brands revealed that the majority of the products are of a smaller size than the size that is deserved. This is the reason why the sample is having problems using it, and it is also the reason why they are found to be having EKG pain concerns when they are wearing it. The sample could go for a size that is larger than their typical offering in order to circumvent this problem.

### **Air Permeability Test**

The air permeability test is a common test that determines how quickly air can move through a fabric and helps to show the fabric's breathability. This test is particularly useful for determining whether or not a fabric is wind-resistant, weather-resistant, or waterproof. The

level of a material's air permeability can be evaluated by measuring the speed at which air moves through an area of known size. This is accomplished by creating a pressure difference of a specified magnitude across a predetermined area of the material. Both of these variables are able to be customized to the specific kind of material that is being evaluated.

The results of the study's air permeability test are summarized in the table that can be found below.

<b>Sample Code</b>	<b>Min</b>	<b>Max</b>	<b>Range</b>	<b>Average</b>
Sample CL-C	38.6	41.8	38.6-41.8	40.32
Sample CL-V1	71.3	75.9	71.3-75.9	72.48
Sample CL-V2	58.7	65.4	58.7-65.4	62.2
Sample AL-C	59.2	65.5	59.2-65.5	61.96
Sample AL-V1	36.3	39.1	36.3-39.1	37.46
Sample AL-V2	76.9	89.1	76.9-89.1	83.94

**Table - 17**

#### **Air Permeability Test**

The sample chudidar length leggings made of cotton fabric had a minimum value of 38.6, a maximum value of 41.8, a range of 38.6 to 42.8, and an average of 40.32. The minimum value was 38.6 and the maximum value was 41.8. The sample chudidar length leggings made of viscose for brand X had a minimum value of 71.3 and a maximum value of 75.9. The range for these leggings was 72.3% to 75.9%, and their average value was 72.48. The sample chudidar length leggings made of viscose for brand Y had a minimum value of 58.7 and a maximum value of 65.4. The range for these leggings was from 58.7 to 65.4, and the average value was 62.2. The sample leggings were ankle length and made of cotton. The lowest possible range was 58.2, and the highest possible range was 65.5. The range indicated that the leggings were between 59.2 and 65.5, and their average value was 61.96. The sample ankle length leggings made with viscose fabric for brand X had a minimum value of 36.3, a maximum value of 39.1, and an average value of 37.46, whereas the sample ankle length leggings made with viscose fabric for brand Y had a minimum range of 76.9, a maximum range of 89.2, and an average value of 83.94.

### Evaluation of Physical Properties on Leggings

Test Particulars	Sample CL-C	Sample CL-V1	Sample CL-V2	Sample AL-C	Sample AL-V1	Sample AL-V2
Average spun yarn count (Ne)	34.56	31.6	35.11	28.46	31.64	35.35
Average elastomeric yarn count (Denier)-given condition	17.15	-	-	20.13	-	-
Elastomeric yarn %	5.92	4.18	4.48	6.31	3.77	4.18
GSM	209.6	251.31	256.1	215.6	255.5	249.6
Courses per inch	63	76	84	62	78	86
Wales per inch	38	42	46	40	43	44
<b>Average loop length (cm)</b>						
Spun yarn	0.295	0.269	0.268	0.297	0.276	0.277
Elastomeric yarn-given condition	-	-	-	-	-	-
<b>Extension and Recovery</b>						
% Extension						
Lengthwise	89	110.5	136.0	78.5	50.5	147
Widthwise	91	104	134.0	90.5	105.5	148
% Recovery						
Lengthwise	6.1	4.0	4.8	5.3	2.7	5.87
Widthwise	8	5.3	9.1	6.7	5.3	8

**Table – 18**

### Evaluation of Physical Properties on Leggings

The leggings' physical attributes were analyzed based on the average number of spun yarns, the average number of elastomeric yarns, the grams per square meter, the number of courses per inch, the number of Wales per inch, spun yarn, elastomeric yarn, loop length, extension, and recovery. The sample with chudidhar length leggings made of cotton fabric had an average spun yarn count of 34.56, while the sample with chudidhar length leggings made of viscose fabric for brand X had a value of 32.6 and the sample with viscose fabric for brand Y had a value of 35.11. The sample with ankle length leggings made of cotton fabric had an average spun yarn count of 28.46, while the sample with ankle length leggings made of visco The average elastomeric yarn count revealed that the value for Chudidhar length leggings made of cotton was 17.25, while the value for ankle length leggings made of cotton fabric was 20.13. Both of these values were determined using samples. The elastomeric yarn percent showed that

sample chudidar length leggings made with cotton fabric had 5.92 percent of elastomeric, whereas for sample Chudidar length leggings made with viscose baric, the elastomeric percent was 4.18; in the case of sample chudidar length leggings made with viscose fabric of brand Y, the elastomeric percent was 4.48; and for sample ankle length leggings made with cotton fabric The GSM reveals that this is the case for sample CL-C 209.5, sample CL-V1 251.31, sample CL-V1 256.1, sample AL-C 215.6, sample AL-V1 255.5, and sample AL-V1 249.6. Sample CL-C had 63 courses per inch, sample CL-V1 had 76 courses per inch, and sample CL-V1 had 84 courses per inch. Sample AL-C had 62 courses per inch, sample AL-V1 had 78, and sample AL-V2 had 8 years. According to the Wales owe inch, the value for CL-C was 38, the value for CL-V1 was 42, the value for CL-V146, and the value for AL-C was 49. All V1 was 43 and AL V2 was 44. For CL-c, the average loop length was 9.29615 cm, followed by CL-V1 at 9.269 cm and CL-V2 at 9.268 cm. For AL-C, the average loop length measured 0.297 cm, while for AL-V1 it measured 0.276 cm and for AL-V2 it measured 0.277 cm.

The specifics of the extension that were shown for lengthwise indicated that CL-C 89, CL-V1 110.5, CL V2 136.0, AL-C 78.t ALV1 50 5 and AL V2 8y was 147, and the details that were shown for widthwise showed that for CL-C it was 91, CL V1 104, CL V2 134.0Al-C 90.5 AL V1 105.5 and AL V2 148. The widthwise recovery for CL-C was 8, but it was only 5.3 for CL-V1, and it was 91 for CL-V2. The AL-C score was 6.7, the AL-C1 score was 5.3, and the AL-V2 score was 8.

# **SUMMARY AND CONCLUSION**

## CHAPTER - 5

### SUMMARY AND CONCLUSION

Compression clothing is intended to be worn so that it is in close proximity to the skin. It should be distinguished by elasticity, superior wearing comfort, and lightness in addition to its general lightness. In order to manufacture functional compression wear, which will boost self-confidence, exercise ability, athletic performance, blood circulation, energy, physical recovery, and reduced muscular fatigue, these features are typically obtained by spinning yarns with specialized functional properties. This process is done in order to produce functional compression wear. Compression garments are garments that apply pressure to the body in order to provide health benefits to the wearer. Some of these benefits include improving blood circulation, molding the body, and assisting in the recovery process following medical treatments. Elastic fabrics are required for compression garments because the amount of stretching that can be achieved by the fabric as well as its ability to maintain the stretching force are directly related to the amount of compression that can be achieved. However, there is currently very little information on the fabric and its mechanical qualities, and there is a demand from manufacturers of compression garments to better understand the properties of the fabric and its applicability.

For exercise, muscular damage is minimized, as well as muscle tremors, vibrations, and soreness. All of these benefits contribute to an improvement in the effect of exercise. The idea that the lower body would be tightened under constant pressure to compensate for the body form is driving an increase in the popularity of leggings, which contrasts with the traditional use of stockings. On the other hand, generic leggings, in contrast to medical compression stockings, are not made with the garment pressure that is provided to each individual body part in mind. Therefore, leggings can potentially obstruct the flow of blood from the ankles to the thighs if they are designed to apply consistent pressure to all parts of the lower extremities, without any gradual increase in the pressure value. Women are more likely than men to suffer from health conditions like varicose veins, for instance.

Therefore, the purpose of the present study was to investigate the typical wear pattern of leggings among a group of selected college students.

#### **Objectives of the study**

- To study the compression level of leggings
- To study the problem faced by the respondents because of high compression

#### **Methodology**

A survey was designed and sent to a representative sample of consumers (n=251) with the objectives of gaining an understanding of the characteristics that customers look for their leggings and determining the compression properties that are associated with wearing tight pant legging. In order to conduct the study, the researcher chose 251 respondents at random among the undergraduate students at the Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore. The administration of the interview schedule served as the primary means of data collection.

To carry out the current research, the investigator has followed the following procedures to select the leggings.

- For the purpose of the study, leggings were chosen as the product type. Type of leggings selected for the study includes chudidar-style leggings as well as ankle-length leggings. Both types of leggings were worn by the participants. Composition of the selected leggings were viscose with elastin and cotton with elastin.
- Leggings brand: for the purpose of the research, the brands X and Y were selected as the sample leggings for comparison. There were two variations of the brand X and Y leggings: one was of the chudidar style, and the other was ankle length. In brand X, leggings made of two type of materials such as Cotton and Viscose and were selected brand Y are leggings made of Viscose was selected for the present study.
- The selected leggings were tested for Compressibility and Air permeability. In addition Yarn count, GSM, Course per inch, Wales per inch, Loop length & Extension and Recovery of the leggings were measured.

### **Findings of the study**

- Of the respondents who were chosen, approximately 77.3 percent were below the age group of 20 years, 22.3 percent were between the ages of 21 and 25 years, and 0.4 percent were older than 26 years. The sample contained around 80.5 percent of students who were enrolled in undergraduate programmes, and 19.5 percent of students who were graduates or professional programs.
- Almost 81.7% of the students in the sample group preferred chudi leggings for their use, while 17.5% were using ankle length leggings and an extremely small percentage of the sample wore knee length leggings or mid-calf length leggings.

- The feeling of being overheated was the most common issue with the chudi leggings, as this was reported by 40.2 percent of the sample. The same was noted for ankle leggings, as this was reported by 12 percent of the sample. However, the majority of the respondents did not have relevant information for the knee length leggings and the mid-calf length leggings. Have the researcher chose the chudi length leggings and the ankle length leggings for the study.
- At the 1 percent level of significance, there is a strong association between the frequency of usage, which includes daily, weekly once, and occasionally, and chudi length leggings and ankle length leggings. For knee length leggings, there is an association as the variable was significant at the 5 percent level of significance. For mid-calf length, however, it was discovered that the variable was not statistically significant.
- Approximately 41.4 percent of respondents felt compression in the thigh region, followed by 19.9 percent of respondents who reported feeling of the tightness in the waist region, and 17.1 percent of respondents who experienced stiffness in the hip region. Remaining respondents complained of discomfort in the region of their knees, calves, and ankles. Majority of respondents favoured using leggings as the daily wear. Many of the respondents experience tightness in the hip and waist area as a result of the elastic waist band, which causes their comfort wear to become disrupted.
- There is a significant correlation between the frequent wearing of leggings and a feeling of tightness among the sample respondents, and this correlation is statistically significant at the 1% level of significance.
- The results of the survey, indicates that majority of respondents (43.62 percent) consider their size to be medium. While 23.90 the present of the respondents correct size. The remaining respondents fell in between the sizes of largen (L), extra-large (XL), and extra extremely large (XXL). Majority of respondents are interested in purchasing leggings from Twin birds and Prisma.
- The height of the sample population ranged from 80 to 109 centimeters, with the remaining between 60 and 80 centimeters and over 100 centimeters. This indicated that the majority of the respondents had an average height between 80 and 100 centimeters. It was noted that majority of the sample respondents classified on measure size based their waist, hip, thigh, calf, and ankle.

- Majority of the respondents in the sample group are wearing leggings on a daily basis. Leggings have become one of the most popular fashion statements among younger people in the present period.
- Approximately 68.9 percent of the sample wanted their leggings to be made out of cotton, while 17.5 percent claimed that they wanted their leggings fabric to be made out of Lycra. Remaining respondents using leggings made out of different types of materials such as nylon, leather, polyester, and fleece.
- The results of the compression test showed that chudithar leggings had lesser compression when compared to ankle leggings and the majority of the participants had purchased a size of leggings that was smaller than their actual size.
- The results of the air permeability test showed that the majority of respondents were having issues with overheating as a result of the fabric treatment mainly in viscose material as viscose had lesser air circulation than cotton material.
- The investigator made an effort to evaluate the leggings' physical properties by using the following test. Physical properties (Yarn Count, GSM, Course Per Inch, Wales Per Inch, Loop Length and Extension and Recover Test) tests were done for all the 6 samples selected: CL-C, CL-V1, CL-V2 and AL-C, AL-V1, AL-V2 (CL – Chudi Legging, AL-Ankle Legging, C-Cotton and V-Viscose).

## **Conclusion**

The younger generation is showing an increased interest in fashion as well as clothing that is connected to fashion. Leggings, which are an item of clothing that cover the legs, have been seen to be in constant demand despite the fact that they are anticipated to be worn by both men and women. They have a figure that is both appealing and skin tight, giving them a defined contour. In this generation's female population, women of all ages are wearing leggings more than any other article of clothing, making them the most popular item of apparel overall. According to the findings of the present study, the vast majority of the participants who were polled expressed support for making use of leggings of a medium size in a considerable number. Additionally, the results of the compression test and the air permeability test showed that the majority of the respondents expressed the difficulty of compression, which resulted in leg pain and heat observant. It is ideal for the samples to select a size that is larger than their genuine size in order to get rid of the problem. The leggings that the responders wear on a daily basis should be comfortable and will be able to function more effectively when appropriate

size is used.

### **Suggestions**

- The majority of respondents said that their leggings were too constricting, and in order to alleviate this problem, it was recommended that they purchase a size larger than their usual one.
- Because a large number of respondents experienced heat loss when wearing their leggings, the problem can be solved by items that are developed with environmentally friendly material.
- One potential solution to the problems associated with leg pain is to minimize the amount of time spent wearing leggings.
- Choosing leggings from a reputable brand can help limit the number of issues that arise when wearing them.

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# **APPENDIX**



**The South India Textile Research Association (SITRA)**

**Centre of Excellence for Medical Textiles**

**Coimbatore - 641014**

**&**

**Avinashilingam Institute for Home Science and Higher Education for**

**Women**

**Coimbatore – 641043**











**Assessment of compressional properties on wearing tight pant leggings**

**Personal details of participants**

Name :	Age :
Address :	Contact no : Mail Id :
Educational qualification : UG / PG / PhD / Graduated	What's your current status? Student / Professional / House wife
Marital status? Mrried / Unmarried	Department :

1) Which type of leggings are your wearing in past 6 months (✓)

Particulars	Chudi Leggings Normal Leggings	Ankle length Leggings	Knee Length Leggings	Mid-Calf Length
				
Select the type you are wearing				
<b>Select the problems you are facing in recent usage of leggings (✓)</b>				
Over heat feel				
Swelling				
Skin itching				
Itching and soreness				
Folliculitis (skin allergies)				
Pressure marks				
Fungal infections				

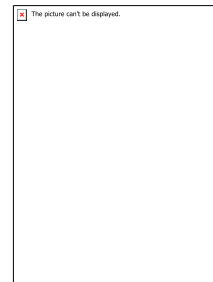
Particulars	Chudi Leggings Normal Leggings	Ankle length Leggings	Knee Length Leggings	Mid-Calf Length
				
Yeast infection				
Skin irritation				
Ringworm				
Skin dryness				
Red marks on the skin				
Restricted movements				
Others (Kindly mention in relevant field)				
<b>Which portion of your leg do you feel the tightness while wearing your existing leggings (✓)</b>				
Waist				
Hip				
Thigh				
Knee				
Calf			Not Applicable	
Ankle			Not Applicable	Not Applicable
<b>Select the size of the leggings used (✓)</b>				
S				
M				
L				
XL				
XXL				
<b>Brand Name (✓)</b>				
Twin birds				
Go colours				
Lyra Lux				
W for Women				
Dixcy Scott				
Melange by Lifestyle				
Prisma				
Biba				
Global Desi				
Bliss Club				
Globus				
Others (Kindly mention in relevant field)				

2) What is your height measurement from waist to ankle?

- \_\_\_\_\_

3) What is your leg measurements?

Waist (cm)	Hip (cm)	Thigh (cm)	Calf (cm)	Ankle (cm)



4) How frequently do you use legging? (✓)

- Daily
- Weekly once
- Occasionally
- Other \_\_\_\_\_

5) Why do you prefer to wear Leggings? (✓)

- Comfortable wear to traveling
- Business casual work environment
- Professional business environment
- Comfortable for working (exercise and yoga etc.)
- Good outfitting
- Attending class
- Other \_\_\_\_\_

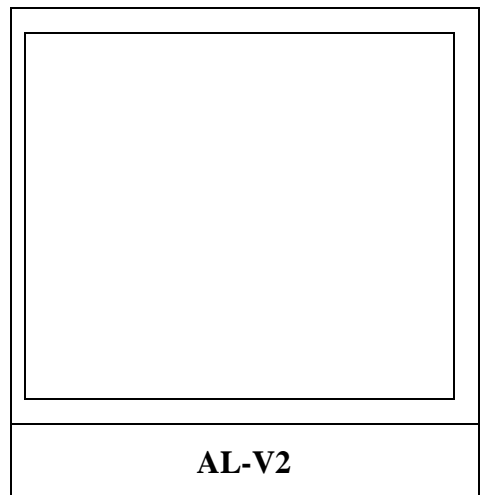
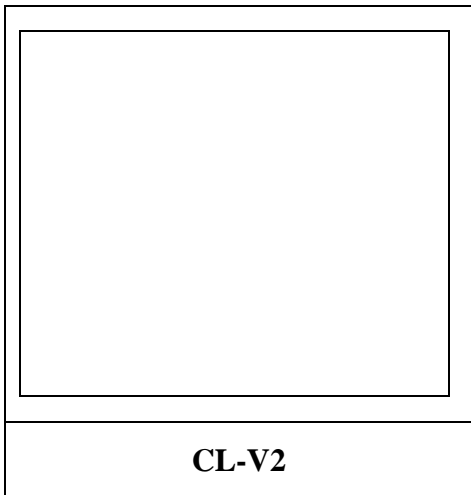
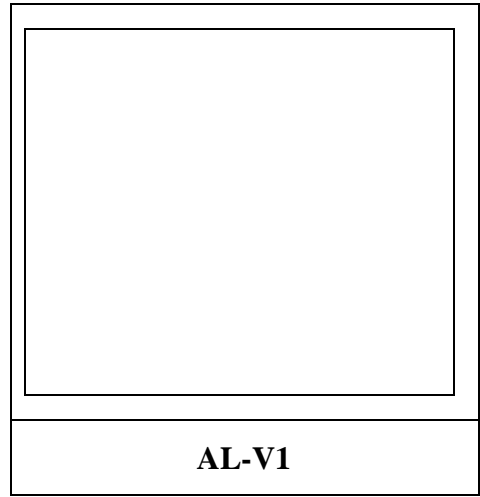
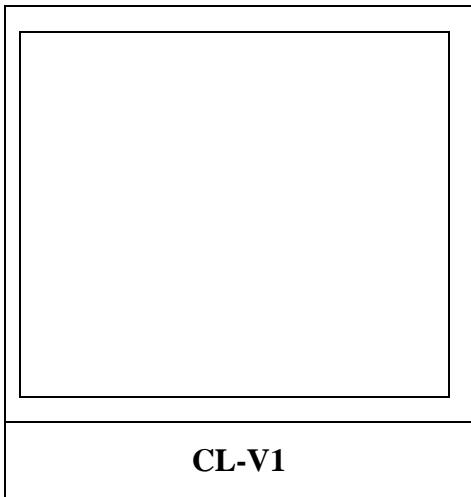
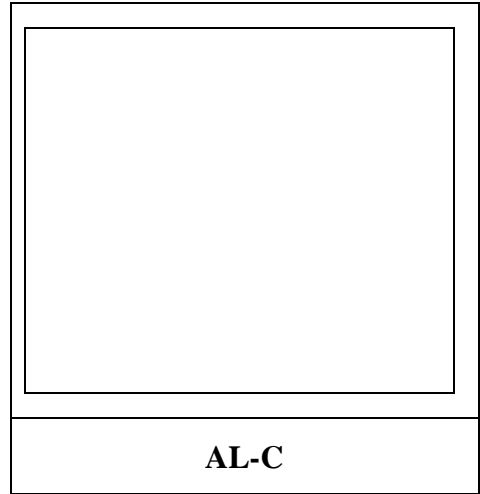
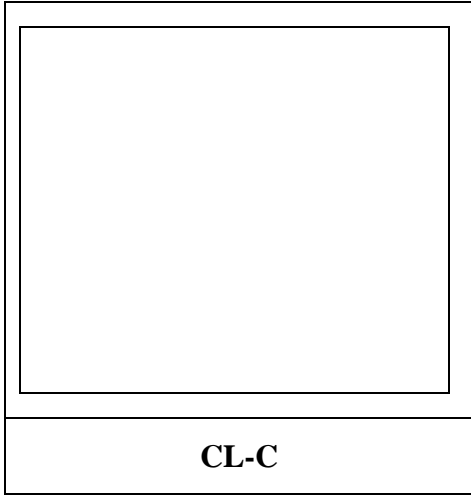
6) If know of above materials is known, please tick (✓) whatever is applicable (eg. Cotton/ polyester/ lycra etc.)

- Cotton
- Nylon
- Lycra
- Leather
- Wool
- Polyester
- Fleece

Date:

Participants Signature

**SELECTED  
LEGGINGS  
SWATCHES**





## THE SOUTH INDIA TEXTILE RESEARCH ASSOCIATION

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### TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms. Ridhuvashini S , M.Sc. Textiles and Fashion Apparel, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-641043 has successfully completed project ( 24<sup>th</sup> January - 2023 to 29<sup>th</sup> April - 2023) on the thesis entitled "Assessment of Relationship between Compression Properties of Tight Wear Pant (Leggings) & its III Effects" under the guidance of Mr.D.Veerabramanian, Scientific Officer -B at the Centre of Excellence for Medical Textiles, The South India Textile Research Association (SITRA), Coimbatore. During the period of project, she was found punctual and hard working.

We wish her every success in her career.

*D. Veerasubramanian*  
Mr.D.Veerabramanian

External Guide

*B. Santhini E*  
Dr.Santhini E

Head of the Department

Place: Coimbatore

Date: 15-05-2023