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Tactile sensation vs emotional study of fabrics

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Abstract
The degree to which our senses are all satiated is what we mean by the aesthetic experience. The human mind's cognitive and affective functions comprise the remainder of the experience. When a product pleases one or more of our senses, it creates an aesthetic experience. It may be aesthetically pleasing, make a pleasing sound, feel nice to the touch, or even smell nice.
Touch is regarded as the most basic sense of touch and the most basic method of communication with the outside world. It is essential for the social, cognitive, and physical development of a baby and child, among other areas.
In this paper, the author explores the importance of touch in consumer experiences and how it influences judgments and attitudes towards products. Consumers can form a holistic perception of a product's aesthetics by integrating information from the visual, aural, tactile, haptic, and proprioceptive systems. Understanding how these sensory systems interact and influence each other can help businesses design products that appeal to multiple senses, creating a more engaging and aesthetically pleasing experience for consumers. By enhancing the tactile qualities of products and designing for positive sensory experiences, businesses can evoke a range of positive emotions in consumers during tactile assessments.
The research was designed to investigate the personal aspects of the perception of tactile surface texture using 12 (6 handlooms and six power looms) different stimuli. Emotions were identified using the PRIMO through a Likert scale (Perceptual dimensions of tactile surface texture: A multidimensional scaling analysis).
These findings suggest that the GSM fabrics can evoke specific emotional responses, highlighting the importance of considering fabric characteristics in design and selection to elicit desired emotional reactions. Findings suggest that fabrics with higher GSM values may be more preferred for eliciting positive emotional responses like satisfaction, joy, and pride than fabrics with lower GSM values.

Keywords: Tactile perception, aesthetic experience, multisensory design, consumer emotions, fabric texture evaluation, GSM and emotional response

1. Introduction
The Government of India has taken steps to develop handloom clusters to improve the livelihoods of weavers. However, productivity issues with the handloom itself have been identified as a bottleneck. Various measures have been initiated to address this and make handloom weaving more attractive and sustainable (Mahato, M., & Das, A. K., 2019) [15]. To improve handloom productivity and to support sustainability, the Indian Government initiated several measures such as:
The National Handloom Development Programme (NHDP) focuses on the holistic development of handloom clusters. Furthermore, the amended Technology Upgradation Fund Scheme (ATUFS) aims to modernize the handloom sector by providing financial assistance for upgrading technology and equipment. Similarly, there are various skill development and training programs to enhance the skills of waivers, including design and product development to meet market demands.
Throughout history, touch has been a crucial sense. Consumers exhibit varying levels of touch during shopping, and the ability to physically interact with a product influences confidence in judgments and attitudes. Individual differences in aesthetic sensitivity, judgment, taste, and choice result in diverse aesthetic experiences (Paul *et al*. W. Van Wieringen, 1996) [1]. The interaction of the visual, aural, tactile, haptic, and proprioceptive systems is necessary for

appreciating a product's aesthetics. Thus, the aesthetics of sound, touch, and scent are important in addition to the aesthetics of sight (Stokburger-Sauer, 2011) [2]. Furthermore, aesthetic pleasure is not an emotion, even though aesthetics has been linked to emotional responses (Leder, 2008) [3]. Aesthetics can evoke positive emotions. For instance, consumers may engage in tactile assessments, such as evaluating the softness of a sweater's fabric or determining the ripeness of a tomato by squeezing it. Similarly, individuals may gauge the weight of a cellular phone through the tactile experience of holding it in their hands. In recent years, heightened consumer awareness of a better quality of life has led to a growing preference for garments that not only possess aesthetic appeal but also offer tactile satisfaction, emphasizing the importance of visual and tactile aspects in the selection of clothing. This trend highlights a shift towards an appreciation for the sensory experience, underscoring the significance of touch in the overall consumer preference for textiles.

However, research has yet to focus on how touch is used for product purchase decisions in handloom versus powerloom in the Kerala market. Fabric characteristics affect the perceived touch (Lord *et al*. 1998) [8], and surface properties are strongly involved in tactile subjective perception (Yoon *et al*., 1984) [9]. Hand-feel properties (i.e., the subjective evaluation of textiles obtained from the sense of touch) significantly contribute to consumers' overall acceptance and preference (Kergoat *et al*., 2012) [7]. However, handlooms play a vital role in India, and efforts are being made to enhance productivity and livelihood for weavers through improved technology and mechanisms. Fabric hand is a critical aspect of textile design, influencing consumer satisfaction and the overall perception of apparel quality. The tactile information is crucial for a consumer to make purchase decisions (Peck & Childers, 2003) [4-5]. Touching and feeling the fabric is one of the most crucial determinants of fabric/apparel purchase decision-making stages.

Nowadays, the quality and comfort of fabrics are becoming increasingly important attributes in the purchase process (Philippe *et al*., 2003; Kaplan & Okur, 2008) [11, 6]. Consumers are looking for feeling well and comfortable, and touch is becoming more important than appearance (Kazuya *et al*., 2004) [12]. The hand, initially posited as a singular organ of touch akin to the organs of other senses (Katz, 2013) [13], has been likened to a person's outer brain (Peck & Childers, 2003) [4-5]. Touch serves diverse functions across species; its specific role in emotional communication needs more in-depth investigation (Hertenstein *et al*., 2009) [14].

Throughout history, touch has been recognized as a crucial sense. Consumers exhibit varying levels of touch while shopping. The ability to touch a product during evaluation affects confidence in product judgments and attitude toward the product. Haptic information (touch-related) plays a differential role among consumers. Some consumers may become frustrated when unable to acquire haptic information, leading them to avoid certain non-touch shopping environments (e.g., online shopping) (Peck & Childers, 2003) [4-5]. While there have been no specific studies examining handloom and powerloom fabric materials in the Kerala market, the role of touch remains significant. Barriers to touch, such as retail display cases, can hinder the utilization of haptic information. This can lead to reduced confidence in product evaluations and increased consumer frustration, especially for those motivated to touch products. Implications for online retailing and traditional stores differ, but both emphasize the crucial role of haptic information in shaping the consumer experience. Although interpersonal touch has been studied in marketing, research on how touch influences product purchase decisions still needs to be done. While casual observation suggests that touch is an important source of information for consumers, its precise role in product judgments and decision-making remains relatively unexplored (Peck & Childers, 2003) [4-5].

Consumer preference for textiles now emphasizes aesthetic appeal and tactile satisfaction, reflecting a shift towards appreciating the sensory experience in clothing selection. However, generalizing fabric evaluation remains challenging (Kaplan & Okur, 2008) [6]. Numerous researchers have investigated how process parameters impact the tactile quality of fabrics. Their findings indicate that sensory perception is influenced by structural factors such as material type, yarn properties, and weaving or knitting conditions.

Numerous academics have looked into how process variables affect the tactile feel of the fabrics. According to their reports, structure elements, including material, yarn qualities, and weaving or knitting circumstances, impact sensory perception. Recognizing the constraints of instrumental methodologies and adopting a comprehensive viewpoint that incorporates subjective assessments can allow researchers to delve deeper into the elements affecting the sensory characteristics of fabrics. This could create materials that offer users a more gratifying and emotionally stimulating experience (Jeguirim *et al*., 2010) [10].

1.2 Problem Identification, Research Methodology, and Significance

The current study aims to understand the relationship between users' physical experiences and reported emotions. It explores the perceived differences in tactile sensations between handloom and powerloom textiles and their emotional significance. Focusing on direct, experiential contact with these materials, it considers their unique characteristics, individual preferences, and emotional responses during evaluation. The research seeks to establish a link between touch and emotion using 110 interviews across 12 fabric types. The PRIMO tool was employed to measure emotions.

2. Methods

2.1 User Study

Examining the tactile experience is pivotal in influencing fabric and apparel purchase decisions. This paper assesses the complexity and significance of tactile differences and emotional aspects when choosing between handloom and powerloom fabrics.

Our exploration focuses on using hands, specifically the fingertips, as sensory tools to perceive and evaluate the tactile textures of various materials. Remarkably, there has been a gap in research addressing the specific nuances of handloom and powerloom fabrics in the Kerala market concerning the confusion, significance of tactile differences, and emotional factors influencing purchase decisions.

While Hornik (1992) delves into interpersonal touch in marketing, exploring its impact on attitudes and behavior, more research still needs to be done on how touch is employed in product purchase decisions. Despite touch being an apparent source of information for consumers, more knowledge is needed regarding its role in product judgments and decision-making processes.

This study conceptualizes touch as a direct experiential interaction with textiles, specifically focusing on handloom and power loom products. The objective is to investigate the

influence of various factors, such as the distinct characteristics of handloom and power loom textiles, individual preferences, and emotional aspects, on the efficacy of utilizing touch information in evaluating these textile products.

Originating from the concept of the hand as a singular organ of touch, likened to a person's outer brain, the term "haptics" was introduced by Révész in 1931. Throughout this article, "haptics" or "the haptic system" consistently refers to the hands' active pursuit and retrieval of information. By addressing the research gap in understanding the role of touch in the evaluation of handloom and power loom textiles, this study aims to contribute valuable insights into the decision-making processes related to fabric and apparel purchases.

2.2 Research Objectives

1. To identify the emotional aspects of fabric with tactile sensation
2. To identify the preference for handloom and power loom based on tactile sensation
3. To identify the relations between GSM and emotional aspects of fabrics

The research was designed to investigate the personal aspects of the perception of tactile surface texture using 12 (6 handlooms and six power looms) different stimuli. Emotions were identified using the PRIMO through a Likert scale (Perceptual dimensions of tactile surface texture: A multidimensional scaling analysis).

2.3 Survey Demographics

Total number of respondents: 110

- **Number of Females:** 77% Females
- **Number of Males:** 23% Males
- **Mean Age:** 22, SD: 3.7

The experiment utilized 12 distinct fabric pieces, comprising six handloom and six powerloom variants. Three different ranges were established within each fabric category based on varying GSM levels. The fabric pieces were randomly shuffled, disregarding GSM and fabric type, and distributed to 110 participants. Participants were instructed to touch and feel the fabric for 5-10 seconds within a box where only their hands could be inserted, preventing visual inspection. Additionally, 14 types of emotions were visually represented using facial emojis (reference: Primo). Participants selected an emotion based on their tactile experience, and the intensity of the chosen emotions was measured on a Likert scale ranging from 1 to 10, with 1 indicating the lowest intensity and 10 the highest. Each participant took 8-10 minutes to complete one survey, and 110 participants were surveyed. The recorded results were collected for subsequent analysis. The survey was conducted with the explicit consent of each participant, who read and understood the consent letter. The survey was conducted in an isolated cabin to minimize distractions, involving only the participant and two surveyors.

Primo focuses on Emotion in Product Interaction; researchers have increasingly studied the affective experience in product-user interactions. Self-report tools are commonly used to measure feelings, often relying on adjectives or emotion names. However, nuances in the affective lexicon require careful translation for cross-cultural use. Primo popularity of Non-verbal self-report tools, such as those proposed by Desmet (2002), are popular in design research. The paper describes creating and evaluating a new set of animations for a non-verbal self-report tool to measure emotions. Multiple studies confirmed that these animations effectively conveyed distinct affective meanings across various contexts and populations.

3. Results

The survey indicates a relationship between emotional touch and the GSM of fabrics. In this research, the author found that higher GSM is associated with positive emotions than lower GSM (See Table 1).

Table 1: Association between tactile sensation and emotions with different GSM of fabrics

Fabric	GSM	Type	Most preferred emotion	Mean rating
Fabric 1	110	Powerloom	Boredom	3.6
Fabric 2	102	Handloom	Boredom	2.95
Fabric 3	105	Handloom	Boredom	2.89
Fabric 3	105	Handloom	Satisfaction	3.2
Fabric 4	96	Powerloom	Satisfaction	3.5
Fabric 4	96	Powerloom	Joy	3.5
Fabric 5	146	Powerloom	Satisfaction	3.9
Fabric 5	146	Powerloom	Joy	3.3
Fabric 6	128	Powerloom	Boredom	2.2
Fabric 6	128	Powerloom	Fascination	2.6
Fabric 7	152	Handloom	Satisfaction	3.1
Fabric 8	130	Handloom	Anger	3.0
Fabric 8	130	Handloom	Disgust	2.8
Fabric 8	130	Handloom	Boredom	2.9
Fabric 9	190	Handloom	Satisfaction	3.3
Fabric 10	219	Handloom	Anger	3.7
Fabric 10	219	Handloom	Disgust	3.3
Fabric 11	195	Powerloom	Satisfaction	3.7
Fabric 12	199	Powerloom	Pride	3.88

The study presented in the file indicates that different fabric GSM types can influence emotional responses such as boredom, satisfaction, and joy. For example, fabric 1, with a GSM of 110, and Fabric 6, with a GSM of 128, both from the powerloom category, were associated with feelings of boredom. On the other hand, Fabric 4 (GSM 96) and Fabric 11 (GSM 195) from the Powerloom category elicited satisfaction and joy, respectively.

Similarly, Fabric 3 (GSM 105) and Fabric 7 (GSM 152) from the Handloom category were linked to satisfaction. In

contrast, Fabric 8 (GSM 130) and Fabric 10 (GSM 219) from the same category were associated with emotions like anger and disgust. Fabric 12 (GSM 199) from the Powerloom category was to the emotion of pride.

These findings suggest that the GSM fabrics can evoke specific emotional responses, highlighting the importance of considering fabric characteristics in design and selection to elicit desired emotional reactions. Based on the emotional ratings, the most preferred fabric GSM types can be identified by looking at the highest mean ratings for emotions such as satisfaction and joy. Fabric 5, with a GSM OF 146 from the Powerloom category, received high ratings for both satisfaction (3.9) and joy (3.3), making it a preferred choice for eliciting positive emotional responses. Fabric 12, with a GSM of 199 from the Powerloom category, also received a high rating for pride (3.88), indicating it as another preferred option for evoking a stronger positive emotion.

These findings suggest that fabrics with higher GSM values, such as Fabric 5 and Fabric 12, are more preferred for eliciting positive emotional responses like satisfaction, joy, pride, and pride than those with lower GSM values. The findings of the study link fabric GSM types to emotional responses and can be valuable in the design and selection of fabrics for various purposes. Here are some ways these findings can be applied:

1. **Emotionally Targeted Design:** Designers can use the knowledge that specific fabric GSM types evoke certain emotions to create products tailored to elicit desired emotional responses. For example, if a designer wants to evoke satisfaction or joy in users, they may opt for fabrics with higher GSM values, like Fabric 5 (GSM 146) or Fabric 12 (GSM 199).
2. **Brand Identity and Marketing:** Brands can leverage the emotional associations of different fabric GSM types to strengthen their brand identity and marketing strategies. By selecting fabrics that align with the emotional attributes they want to convey, brands can create a more cohesive and impactful brand experience.
3. **Product Differentiation:** In a competitive market, understanding how fabric characteristics influence emotional responses can help companies differentiate their products. Companies can create unique selling points by choosing fabrics that resonate with their target audience's emotions.
4. **Enhancing User Experience:** In various industries such as fashion, home decor, and automotive, selecting fabrics based on their emotional impact can enhance the overall user experience. For instance, fabrics that evoke satisfaction and joy in clothing or interior design can produce more positive user experiences.
5. **Customization and Personalization:** Understanding the emotional responses to fabric GSM types can also enable customization and personalization of products based on individual preferences. By offering a range of fabric options that cater to different emotional needs, companies can provide more personalized experiences for their customers.

4. Discussion

4.1 Analysis and Implications of Tactile Sensation and Emotional Responses to Handloom and Powerloom Fabrics

The study exploring the tactile sensation and emotional responses to handloom and powerloom fabrics presents intriguing insights into how consumers perceive these textiles and what factors contribute to their emotional responses. The findings suggest a notable trend: fabrics with a higher GSM (grams per square meter), irrespective of whether they are produced by handloom or powerloom methods, tend to evoke more positive emotions in consumers. This discovery challenges the traditional belief that handloom fabrics inherently offer a superior tactile experience or evoke stronger emotional connections merely due to their artisanal production process.

One of the most significant aspects of the study is that the distinction between handloom and powerloom does not play a crucial role in generating positive emotions. This observation is particularly interesting because it suggests that consumers' emotional responses may not be as closely tied to the production method as previously thought. The study employed a blindfolded methodology, eliminating visual cues that might influence participants' perceptions. As a result, the findings reveal that the tactile qualities of the fabric, particularly the GSM, are more influential in shaping emotional responses than the knowledge of whether the fabric was made by hand or machine.

This outcome has important implications for how handloom fabrics are marketed and positioned in the competitive textile industry. Traditionally, handloom fabrics have been promoted based on their artisanal value, the human touch involved in their creation, and the cultural significance of the handloom industry. However, if these factors do not significantly impact the consumer's tactile experience or emotional response, it may be necessary to rethink the marketing strategies employed for handloom products.

One potential avenue for re-strategizing is to highlight other unique attributes of handloom fabrics that are not directly related to tactile sensation but are important to modern consumers. For example, the mode of production for handloom fabrics involves a minimal carbon footprint, an aspect that resonates strongly with environmentally conscious consumers. Additionally, producing handloom fabrics requires significant human effort; investing real person-hours into each piece adds to the fabric's value in craftsmanship and authenticity. Furthermore, the imperfections and irregularities in weave patterns and GSM distribution, often seen as flaws, can be repositioned as unique features that emphasize the artisanal nature of handloom products. These characteristics could be leveraged in marketing communications to appeal to consumers who value sustainability, craftsmanship, and the authenticity of handmade goods.

The study also opens the door to considering how powerloom fabrics might evolve to compete more directly with handloom products. If powerloom fabrics could be produced using renewable energy sources or other innovative methods that minimize their carbon footprint, they could match handloom fabrics in terms of environmental impact. However, a critical difference would remain: the need for more human involvement in production. This lack of human touch is a distinguishing factor that handloom advocates emphasize in their marketing efforts. However, the potential for powerloom fabrics to adopt sustainable practices must be addressed, raising important questions about the future of the textile industry.

In light of these findings, it becomes clear that there is a need to re-strategize communication objectives and the messages conveyed to consumers regarding handloom and powerloom fabrics. Educating consumers on handloom production's environmental and human aspects could be key to maintaining its market value. Additionally, further research is needed to

explore the current average carbon footprint associated with power loom production, a factor not covered in the present study. Understanding this aspect could be pivotal in shaping the narrative around power loom fabrics and their place in a sustainable future.

In conclusion, the study on tactile sensation and emotional responses to handloom and powerloom fabrics suggests that while GSM plays a significant role in evoking positive emotions, the method of production (handloom versus powerloom) may not be as influential as previously believed. This finding invites a re-evaluation of how handloom fabrics are marketed and positions the unique, non-tactile attributes of handloom products as critical factors for future strategies. As the textile industry continues to evolve, these insights could be crucial in ensuring that handloom and powerloom fabrics are appreciated for their respective strengths, allowing consumers to make more informed and values-driven choices.

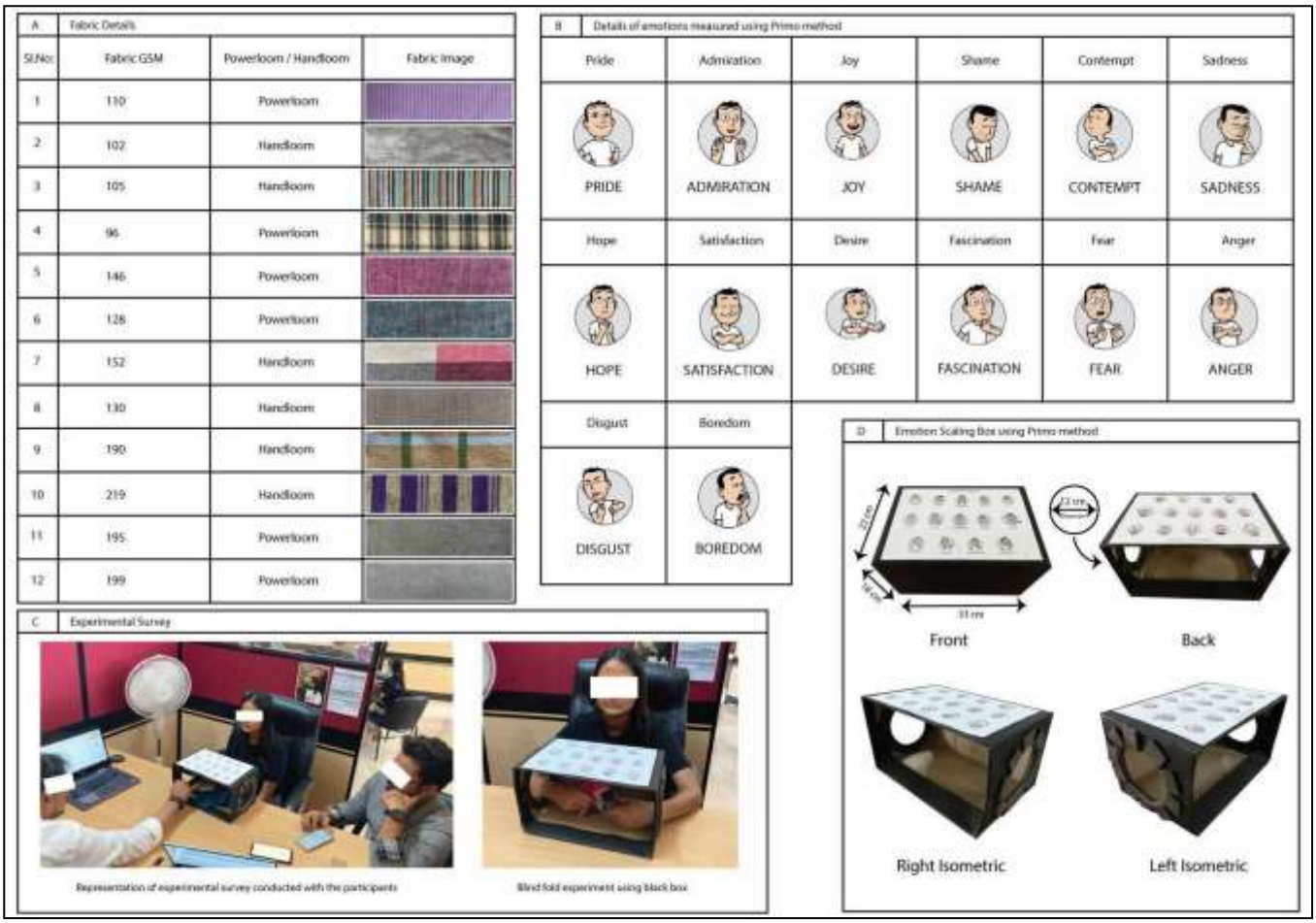

Fig 1: A. Fabric details, B. Details of emotions measured using Primo method, C. Experimental Survey, D. Emotion Scaling Box Using Primo Method.

4. Conclusion

In conclusion, the findings of this study can be applied in the design and selection of fabrics to create products that resonate with users on an emotional level, enhance brand identity, differentiate products, improve user experience, and enable customization. The study indicates the influence of fabric GSM on emotional responses. Fabric 5 (GSM 146) elicited high satisfaction and joy, while Fabric 12 (GSM 199) evoked pride. This highlights the importance of considering GSM in fabric design to evoke desired emotions. Such insights offer applications for designers, brands, and companies, enabling emotionally targeted products, enhanced marketing strategies, and product differentiation. Fabrics with higher GSM values, like Fabrics 5 and 12, may evoke positive emotions, shaping user experiences and brand identity.

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