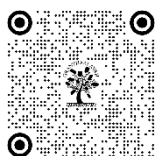


FABRIC QUALITY AND PROPERTIES CONSIDER FOR SPORTS WEAR- AESTHETIC AND FUNCTIONAL NEED

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DOI

[10.29121/shodhkosh.v5.i4.2024.3834](https://doi.org/10.29121/shodhkosh.v5.i4.2024.3834)

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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ABSTRACT

This study explored experts' perspectives on sports clothing quality, key attributes, and evaluation processes. Twenty-two experts in sports clothing development and evaluation were interviewed using semi-structured methods. Thematic analysis revealed three perspectives on quality, challenges in the evaluation process, and a framework for assessing sports clothing quality. Experts viewed quality as fulfilling use-case requirements, creating an immediate impression, or reflecting individual perception. The framework deconstructed overall quality into attributes and linked them to specific evaluation methods. Challenges such as limited measurability of attributes were identified, with digitalization proposed as a potential solution.

Keywords: Sports Clothing Quality, Digitalization, Clothing Development

1. INTRODUCTION

In the world of sportswear, fabric quality plays a critical role in meeting both aesthetic and functional requirements. As the demand for performance-enhancing apparel grows, athletes and fitness enthusiasts look for garments that not only look good but also perform exceptionally well under strenuous conditions. Sportswear fabric must offer durability, breathability, moisture-wicking, flexibility, and comfort, all while maintaining an appealing aesthetic. From professional athletes to casual gym-goers, the design and function of sportswear directly impact performance. The choice of fabric is influenced by factors such as the type of sport, climate, and body movement. Different sports require specialized clothing with specific properties to enhance comfort and efficiency, while also reflecting individual style and fashion preferences. This introduction lays the foundation for a deeper exploration into how fabric quality and its properties satisfy both

aesthetic and functional needs in sportswear. So, what are we looking for in high performance sportswear once a look at some of the biggest considerations in aesthetic and functional aspects of the sportswear.

In sportswear, fabric quality is integral not only to the function of the garment but also to its aesthetic appeal. A well-balanced combination of design, comfort, durability, and performance ensures that the fabric meets the diverse demands of athletes and fitness enthusiasts. These factors underscore the importance of choosing fabrics that not only meet functional needs but also enhance the wearer's overall experience through comfort, durability, and aesthetics.

Most existing research focuses on consumers. However, experts' views can provide essential insights, as not all quality aspects are obvious to the consumer. In this context, the present study investigates the following research questions:

1.1. WHAT ARE THE GENERAL ASPECTS UNDERSTAND FOR SPORTS WEAR?

1.2. INTO WHICH CHARACTERISTIC'S NEEDS FOR SPORTSWEAR FABRIC/BEST FABRICS FOR SPORTSWEAR?

1.3. WHAT DO TEXTILE EXPERTS THINK OF THE PHYSICAL PROPERTIES OF THE SPORTS CLOTHING

General aspects understand for sportswear: Sportswear refers to clothing specifically designed for athletic activities and sports. These garments are made with unique features to ensure comfort, functionality, and performance enhancement. Below are the general aspects of sportswear:

1) Design

The ability of a fabric to hold embroidery is essential for achieving complex designs, particularly in branded sportswear. The material's capacity to support stitching without compromising the design or functionality is crucial. Beyond functional design, sportswear also serves as a fashion statement, making the fabric's aesthetic potential a significant consideration.

- **Comfort**

Comfort is paramount when choosing sportswear fabric. The material must be soft, flexible, and offer stretch resistance to allow full mobility. Whether engaging in low-intensity or high-impact sports, discomfort can distract athletes and reduce performance. Therefore, fabrics that offer both comfort and flexibility are key.

- **Weight and Durability**

Sportswear must be durable enough to withstand rigorous physical activity without wearing out quickly. Lightweight materials are often preferred in many sports, as they minimize the energy drain caused by excess fabric weight. The right fabric will balance strength and lightness, ensuring longevity and performance optimization.

- **Moisture Regulation**

Effective moisture-wicking properties are critical for keeping the body cool and dry during intense physical activities. Fabrics must be breathable and able to transport sweat away from the skin, preventing discomfort, overheating, or cooling that may lead to injuries like muscle cramps or strains.

- **Protection against the Elements**

In outdoor sports, fabrics that offer protection from wind and rain are indispensable. Advances in fabric technology have made it possible to develop waterproof and wind-resistant materials, allowing athletes to train or compete in various weather conditions without compromising comfort or safety.

- **Price**

The cost of fabric plays a significant role in its selection for sportswear. While performance is essential, the price must be reasonable compared to similar fabrics. A high price tag must be justified by superior functionality or a unique selling point that distinguishes the fabric in a competitive market.

1) The best Fabric for sportswear: The best fabric for sportswear is typically selected based on its ability to balance comfort, functionality, and performance. Here are some of the most commonly used fabrics and their properties that make them ideal for sportswear in below mentioned table with their characteristics:

S. No	Fabric Types	Properties	Sportswear based characteristics	Uses-Functional Value/Aesthetic Values
1.2.1	Polyester	Durable, lightweight, moisture-wicking, quick-drying, and breathable	. It wicks moisture away from the body, keeping athletes dry during intense workouts. It's also resistant to shrinking and stretching, making it durable for long-term use.	t-shirts, shorts, and tracksuits.
1.2.2	Nylon	Soft, stretchy, abrasion-resistant, and quick-drying.	It's flexibility and smooth texture, nylon offers excellent stretch and recovery, allowing for full mobility during strenuous activities. It's also moisture-wicking, helping regulate body temperature.	Often used in leggings, shorts, and lightweight jackets.
	Spandex	Extremely stretchy, form-fitting, durable, and resilient.	Spandex is the go-to fabric for sportswear that requires a high degree of stretch, such as compression garments	Common in leggings, cycling shorts, and compression wear.
	Merino Wool	Breathable, moisture-wicking, odor-resistant, temperature-regulating.	While wool might not be the first material that comes to mind for sportswear, Merino wool offers excellent moisture-wicking properties and can keep you warm in cold conditions and cool in hot conditions. Its natural antibacterial properties also help reduce odor.	outdoor sports like hiking and running, especially in cooler climates.
1.2.3	Bamboo Fibers	Soft, moisture-wicking, hypoallergenic, and eco-friendly.	Bamboo is a sustainable fabric with excellent moisture-wicking properties. It is breathable, antibacterial, and offers a soft feel against the skin, making it great for sports where comfort is a priority	Often used in yoga wear and casual sports clothing.

1.2.4	Polypropylene	Water-resistant, breathable, moisture-wicking.	Polypropylene is used in sportswear because it does not absorb water, making it perfect for wet environments. It pushes moisture to the outer layers of the fabric, keeping the skin dry	Often used in yoga wear and casual sports clothing.
	Cotton Blend	Soft, breathable, and comfortable.	While 100% cotton can retain moisture, blends of cotton with synthetic fibers like polyester can offer better moisture-wicking properties. Cotton blends maintain softness and comfort while improving functionality	Casual sportswear and light workouts.
1.2.5	Gore-tex	Waterproof, windproof, and breathable.	Gore-Tex is a high-performance fabric used in sportswear for extreme weather conditions. It keeps the body dry by preventing water from penetrating while allowing moisture to escape	Outdoor sports gear like jackets and shoes, especially for running, hiking, and skiing

2) Below mentioned concluded Comparative table of the tensile strength and elongation properties for polyester, nylon, merino wool, bamboo fiber, polypropylene, cotton blend, and Gore-Tex. Note that the exact values can vary depending on the specific fabric weave, treatment, and blend, but these are general ranges based on commonly available data.

S.No	Fiber Type	Finding Characteristics
1	Polyester	Strong, durable, and resistant to stretching and shrinking.
2	Nylon	Excellent tensile strength, often higher than polyester, very flexible.
3	Merino Wool	Weaker than synthetic fibers, but has natural elasticity and warmth.
4	Bamboo Fiber	Natural fiber, sustainable, but less durable compared to synthetic materials
5	Polypropylene	Lightweight and resistant to fatigue, but generally lower strength
6	Cotton Blend	Varies depending on the blend; higher strength when mixed with synthetics.
7	Gore-Tex	Known for waterproof and breathable properties, less focus on tensile strength.

3) Physical Properties of Sportswear: Below mentioned a comparative table highlighting the compression-related physical properties of different sportswear polyester, nylon, merino wool, bamboo fiber, polypropylene, cotton blend, and Gore-Tex from a sportswear perspective. These materials are often chosen based on their ability to provide compression, durability, and comfort during athletic activities.

Fiber Type	Compression Recovery	Breathability	Moisture Management	Durability Under Compression	Elasticity (Stretch)	Comfort (Feel on Skin)
Polyester	Moderate to High	Moderate to Good	Good (Wicks moisture)	High (Holds shape under pressure)	Moderate (Depends on blend)	Slightly rough, but improved with modern finishes
Nylon	High	Moderate to Good	Excellent (Fast-drying)	Very High (Retains shape well)	Very High (Great stretch)	Smooth and soft
Merino Wool	Low to Moderate	Excellent	Excellent (Absorbs and wicks)	Moderate (Can lose shape over time)	Moderate (Natural elasticity)	Soft, breathable, and warm
Bamboo Fiber	Low to Moderate	Very Good	Good (Natural breathability)	Moderate (Loses compression)	Moderate	Soft, eco-friendly, and smooth
Polypropylene	Moderate to High	Good	Very Good (Hydrophobic)	High (Resistant to compression)	Moderate	Smooth, but can feel synthetic
Cotton Blend	Low to Moderate	Poor to Moderate	Poor (Absorbs moisture but slow to dry)	Low (Loses shape under pressure)	Low to Moderate	Soft, but retains moisture
Gore-Tex	Low (Focus on waterproofing)	Good (Breathable membranes)	Good (Moisture-resistant)	High (In waterproof applications)	Low (Not designed for stretch)	Can feel stiff depending on application

1.3.1. EXPLANATION BASED ON PROPERTIES MENTIONED IN TABLE NO-1.3

- **Compression Recovery:** Ability to return to its original shape after compression. High recovery is important for maintaining support in sportswear.
- **Breathability:** The ability of the fabric to allow moisture and air to pass through, crucial for sports performance.
- **Moisture Management:** How well the fabric wicks moisture away from the body, keeping athletes dry.
- **Durability under Compression:** How well the fabric maintains its structure and effectiveness when subjected to repeated compression.
- **Elasticity (Stretch):** The fabric’s capacity to stretch and return to its original size, essential for mobility and flexibility in sportswear.

Comfort: How the material feels when worn, which is key for long-lasting wear during physical activities.

A comparative table with some statistical values for key physical properties (tensile strength, elongation, moisture regain, thermal conductivity, and density) of polyester, nylon, merino wool, bamboo fiber, polypropylene, cotton blend, and Gore-Tex used in sportswear. These values are representative ranges and can vary based on specific fabric treatments or blends.

Fiber Type	Tensile Strength (MPa)	Elongation (%)	Moisture Regain (%)	Thermal Conductivity (W/mK)	Density (g/cm ³)
Polyester	300-800 MPa	15-30%	0.4-0.8%	0.04-0.06 W/mK	1.38-1.41
Nylon	400-850 MPa	18-45%	3.5-4.5%	0.24 W/mK	1.13-1.15
Merino Wool	150-300 MPa	20-40%	16-18%	0.035-0.05 W/mK	1.30-1.32
Bamboo Fiber	200-600 MPa	10-20%	8-12%	0.04-0.06 W/mK	1.3-1.4
Polypropylene	150-300 MPa	20-30%	0.01-0.05%	0.12-0.22 W/mK	0.90-0.92
Cotton Blend	200-400 MPa	5-20%	7-8%	0.04-0.06 W/mK	1.54-1.56
Gore-Tex	100-250 MPa (Laminate)	10-25%	<0.5%	0.025-0.035 W/mK	1.5-1.6 (Laminate)

Explanation:

- Tensile Strength (MPa): The maximum stress a material can withstand while being stretched or pulled before breaking.
- Elongation (%): The extent to which a material can stretch before it breaks, important for flexibility and comfort in sportswear.
- Moisture Regain (%): The amount of moisture absorbed by the fiber when it is in equilibrium with the surrounding atmosphere. Higher values typically indicate better moisture absorption.
- Thermal Conductivity (W/mK): The ability of a material to conduct heat, influencing warmth or cooling properties.
- Density (g/cm³): The mass per unit volume, affecting the weight and feel of the fabric

2. CONCLUSION

The right choice of fabric can make a big difference in the performance and comfort of your sportswear brand. The fabric you use should be moisture-wicking, breathable, and durable, so your customers can focus on their workout and not on how hot or sweaty they're getting for most sports activities, polyester, nylon, and spandex dominate the sportswear market due to their versatility, durability, and ability to keep athletes comfortable during high-performance activities. However, natural fabrics like Merino wool and bamboo are excellent choices for those looking for more eco-friendly or temperature-regulating options.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

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