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Moisture-Wicking Technology in Sports Hijabs

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Abstract

This study discusses the application of moisture-wicking technology to sports hijab as a solution to the challenges of comfort and performance for Muslim athletes. One of the important technologies in the development of sports hijab is moisture-wicking technology, which functions to channel moisture from the skin to the surface of the fabric, thus maintaining user comfort during physical activity. The purpose of this study is to analyze innovations in sports hijab materials and designs that can increase comfort, absorb sweat, and support athlete performance during physical activity. The method used is a literature study and analysis of sports hijab products from various leading brands, by examining material specifications, designs, and their impact on comfort and performance. The results of the study show that the use of materials with moisture-wicking technology, such as a mixture of cotton, rayon, and polyester with special knitting or weaving techniques, can increase air circulation and moisture absorption, so that the hijab remains light and comfortable to wear in various conditions. In conclusion, the development of sports hijabs based on moisture-wicking technology is very important to support the participation and optimal performance of Muslim athletes in various sports.

Keywords: *sports hijab, moisture-wicking, comfort, athletic performance, textile*

INTRODUCTION

The hijab (headscarf and robe) is a standard item of Muslim clothing, the use of which is prescribed by Islamic law; it covers the head, neck and chest, conceals a woman's hair, and leaves the face uncovered (Salsabila et al., 2024). The wearing of the jilbab has also become a symbol of identity for many women worldwide, as well as a symbol of religious and cultural identity (Nurhalisa, 2024). The sports hijab is a type of hijab specifically designed for use by Muslim athletes participating in various sports (Wardaniah

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& Pratama, 2024). Sports hijabs are now growing rapidly alongside the increasing participation of Muslim women in sporting activities. One of the key innovations in sports hijabs is the application of moisture-wicking technology, designed to enhance the wearer's comfort and performance by keeping the skin dry and cool during exercise (Saaidin et al., 2024). This technology addresses the primary challenge of wearing a hijab during physical activity: the accumulation of sweat and heat around the head and neck.

Sport also plays a significant role in development (Sport et al., 2025). Sport is one area where wearing a hijab can present various practical challenges. These challenges can be linked to the potential physical limitations of modest clothing, which may restrict movement or be uncomfortable to wear during strenuous physical exercise. The hijab in sport has claimed many victims; athletes who have withdrawn from competitions, such as Noor Abukaram, 16, were barred from participating in a district-level running event in Ohio in 2019 (Baharudin et al., 2021).

In recent years, the clothing industry has increasingly responded to Muslim women's desire to find practical solutions that address the difficulties associated with wearing a hijab during physical exercise. Fabric technology and design continue to be improved to enhance athletes' performance and increase comfort (Wardaniah & Pratama, 2024). This has, for example, led to the development of sports hijabs. When designing sports hijab apparel, manufacturers have addressed the concerns faced by competing athletes whilst wearing a hijab, examining how these affect their performance. Currently, the hijab is also being considered by global fashion brands such as Nike. Nike has designed a hijab specifically for sporting activities with stretch to adapt to the wearer's head (Scarono in Baharudin et al., 2021); Nike produces The Pro Hijab, which is stretchy to fit the wearer's head, and its cut is optimised for sport (Chen et al., 2023).

Chiffon, cotton or viscose hijabs make us look and feel fabulous on other occasions. However, when it comes to working up a sweat, the materials mentioned above are not suitable. Therefore, choosing the right fabric for a sports hijab is essential. A fabric's structure and thickness can influence heat and moisture transfer and, consequently, thermal comfort. This is because the structure and thickness of the fabric affect air and moisture permeability, which play a crucial role in heat and moisture transfer (Khan et al., 2022); consequently, every active female athlete needs to wear a hijab with

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sweat-wicking properties to ensure they do not faint during exercise due to ineffective heat transfer.

Modern consumers' interest lies not only in an attractive appearance but also in comfort; comfort is a basic consumer need (Liu et al., 2020). Physical condition is a crucial factor in enhancing athletic performance (Pratama et al., 2024). Comfortable textiles have been observed for sportswear applications because comfort plays a vital role in the wearer's performance (Chen et al., 2023). The ability of clothing or fabric to absorb sweat and facilitate evaporation depends on the air and water vapour permeability of the garment or fabric. This also influences the warmth or coolness of the fabric. Water vapour permeability is a measure of breathability or a textile's ability to manage moisture; thus, the higher the water vapour permeability of a garment, the greater its ability to absorb sweat. This is advantageous during exercise because the ability to absorb sweat allows for a rapid reduction in core and skin temperature (Putra et al., 2020).

Thermophysiological comfort relates to the properties of clothing that allow the transfer of heat and moisture, and plays a crucial role in the use of clothing (MD & Achiria, 2020). In hot climates or during exercise, the human body regulates its temperature through the secretion and evaporation of sweat (Manshur, 2020). To maintain thermal balance and bodily comfort, clothing must allow sweat to escape into the environment. If sweat moisture adheres to the inner surface of the garment, it may cling to the skin and cause discomfort (Lelitasari et al., 2023). Sweat and moisture can be transferred through clothing in liquid and vapour form (Lidianti et al., 2022). Liquid water is transferred through porous textiles via wetting and absorption (Syafaruddin & Mahfiroh, 2020). When sweat wets the fabric, absorption can occur in the spaces between fibres and threads under capillary pressure (Nurhalisa, 2024).

Water vapour passes through the air spaces between fibres and yarns and along the fibres, driven by the vapour pressure gradient between the wet inner fabric surface and the environment on the outer fabric surface. This process facilitates greater sweat evaporation by reducing the vapour pressure at the liquid site and enhancing its evaporation potential (Harris & Kurniati, 2021). Heat transfer through fabric involves conductive heat transfer through solid yarns and the air spaces between them, convective heat transfer through the gaps between the yarns, and radiative heat transfer through the yarns and the gaps between them (Thomi Rafif Setyawan et al., 2021).

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The fabric used in hijabs can be made from a blend of 100% cotton, rayon or polyester, using knitted or woven materials; however, Muslim women consider factors such as the fabric's texture, comfort, colour and hygiene (Hardiyanto et al., 2020). Depending on the occasion, other factors may be considered more important when selecting hijab materials (Baharudin et al., 2021). Hijab fabric must be chosen carefully, particularly for sporting activities in hot conditions, to minimise unpleasant experiences when wearing a hijab, such as sweat on the neck, the fabric flapping whilst moving, or unsightly sweat stains (Baharudin et al., 2021). Hijab materials with effective moisture management properties can contribute to the wearer's comfort, particularly due to the higher metabolic activity associated with physical exercise. Moisture management is a key factor influencing the comfort level of any type of clothing (Asfand et al., 2024).

METHOD

This study employs a qualitative descriptive approach using the Systematic Literature Review (SLR) method and an analysis of sports hijab products. This approach aims to explore and analyse the application of moisture-wicking technology in sports hijabs, as well as its impact on the comfort and performance of Muslim female athletes. The SLR approach was chosen as it provides a systematic, transparent, and comprehensive synthesis of previous findings relevant to the research focus. Data collection was conducted through a systematic literature search of various academic and industry sources.

The literature used includes nationally and internationally indexed scientific journals, conference proceedings, technical articles, and textile industry reports, as well as sports hijab products from leading brands such as Nike, Raqtive, and Haute Hijab. The databases used in the search include Google Scholar, ScienceDirect, Scopus, and SAGE Journals. The inclusion criteria for the literature encompass publications from the last 5 years (2020–2025), written in English or Indonesian, and discussing the topics of moisture-wicking, thermophysiological comfort, sports hijab design, and performance textiles. The exclusion criteria include articles that are irrelevant, do not have full-text availability, or have not undergone a peer-review process. The stages of the SLR conducted included:

1. Identification of the research question, namely how moisture-wicking technology

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is applied to sports hijabs and its impact on athletes' comfort and performance;

2. Development of the review protocol, including the establishment of inclusion and exclusion criteria;
3. Systematic literature search using keywords such as "sports hijab", "moisture-wicking textile", "thermal comfort", and "performance sportswear";
4. Selection of literature based on abstracts and content, subsequently organised using the PRISMA flowchart;
5. Assessment of study quality through an evaluative approach to methodology, relevance, and data validity;
6. Data extraction and analysis using a content analysis approach.

In addition to the literature review, a descriptive analysis was also conducted on sports hijab products from various brands, focusing on aspects such as fabric material, knitted or woven structure, moisture-wicking ability, and ergonomic design. Content analysis techniques were used to identify thematic patterns regarding the relationship between textile structure, design, and the comfort and performance of sports hijabs. Through a combination of the SLR method and product studies, the findings of this research are expected to provide an in-depth scientific overview and evidence-based recommendations for the development of sports hijabs that support optimal comfort and performance for Muslim female athletes.

RESULT

wicking technology play a significant role in enhancing the comfort of wearing a hijab during exercise. Moisture-wicking is the ability of a textile material to draw moisture (sweat) from the skin's surface to the outer layer of the fabric so that it can evaporate more quickly; for instance, polyester with a specific knitted structure has a high capacity to absorb and evaporate sweat efficiently (Guru et al., 2021). Sports hijab products from leading brands such as Nike have incorporated materials with the ability to absorb and evaporate sweat rapidly, such as combinations of cotton, rayon, and polyester, spandex, polyamide, and innovations like S. Café, which combines recycled coffee fibres with polyester to enhance absorbency and accelerate evaporation (Jerkovic et al., 2025), designed with specialised knits or weaves. The yarn structure and fabric porosity significantly influence moisture-wicking effectiveness, where yarns with specialised

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capillary channels can accelerate fluid transport. The findings also indicate that ergonomic hijab designs can minimise movement restrictions and boost the confidence of Muslim female athletes (Yahia et al., 2024).

Several leading sports hijab brands, such as Nike Pro Hijab, Haute Hijab FlexFit, and Raqtive, have adopted moisture-wicking technology in their products, such as "The Pro Hijab", which uses elastic, lightweight, and breathable materials to support the athletic activities of Muslim women without compromising movement performance. Features offered include lightweight, elastic, wrinkle-resistant, quick-drying materials, as well as ergonomic designs that support intensive activities without compromising comfort or aesthetics. The use of polyester and polyamide-based fabrics with specific knitted structures provides an optimal combination of elasticity, absorbency, and air circulation (Bahrainwala & O'Connor, 2022).

The enhanced comfort and performance of these sports hijabs allow Muslim female athletes to participate optimally in physical activities without feeling burdened by their clothing. The use of materials with high air and water vapour permeability has been shown to support the body's cooling process during sporting activities, which indirectly has a positive impact on athletic performance.

Hijabs with moisture-wicking technology are able to absorb and wick sweat from the skin to the fabric's surface, allowing it to evaporate more quickly. Observations of product samples indicate that a high-quality hijab possesses the following characteristics:

1. High moisture absorption.
2. Lightweight and elastic fabric texture.
3. Good air ventilation.
4. Ergonomic design (fits the head well, does not slip off easily).
5. Does not cause irritation or excessive heat.

DISCUSSION

Moisture-wicking is the ability of a textile material to draw moisture (sweat) from the skin's surface to the outer layer of the fabric so that it can evaporate more quickly; an ideal sports hijab is made from a material that provides optimal thermophysiological comfort. The use of technology in sport can help improve knowledge and encourage the

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development of smart sport (Pratiwi et al., 2024). A fabric's ability to absorb and evaporate sweat plays a major role in maintaining a stable body temperature during physical activity, particularly in hot or humid environments. Synthetic materials such as polyester, spandex, polyamide, and innovations like S.Café—which combines recycled coffee fibres with polyester to enhance absorbency and accelerate evaporation through moisture-wicking technology—offer these advantages, as they are specifically designed to support rapid evaporation via moisture transfer from the inside to the outer surface of the fabric. This evaporation process occurs due to a vapour pressure gradient, whereby water vapour moves from the skin area into the environment through the pore spaces between the fabric fibres. The speed of this transfer determines how quickly the wearer's skin remains dry and cool, which directly impacts comfort and performance during exercise.

A hijab made from materials that do not support air circulation and moisture management can lead to sweat build-up, reduced comfort, and the risk of skin irritation. Therefore, fabric structure, fibre type, and material thickness are key indicators that must be considered in the production of sports hijabs (Amalina et al., 2022). Moisture-wicking technology in sports hijabs is a significant innovation in supporting the physical activities of Muslim female athletes. The primary function of this technology is to keep the skin dry during intensive activities, thereby stabilising body temperature and reducing the risk of heat-related dehydration.

Design also plays a central role in user comfort. A good sports hijab is not only lightweight and elastic but also has an aerodynamic shape and covers the aurat in accordance with Sharia regulations. Industry responses, such as Nike's creation of hijabs with functional designs, demonstrate that a textile technology-based approach has addressed the needs of modern Muslim female athletes. In addition to materials, ergonomic design also contributes to comfort, for example through a snug fit that does not shift easily during movement (Lao et al., 2020), providing Muslim female athletes with greater confidence and freedom of movement. Beyond comfort, hijabs with moisture-wicking technology also support overall sporting performance. Athletes who feel comfortable whilst exercising will be more focused and able to maintain their stamina for longer. This is particularly important in sports requiring prolonged duration or intense movement, such as athletics, archery, or martial arts.

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Thus, the application of moisture-wicking technology in sports hijabs not only provides a functional solution but also reflects inclusivity within the modern sporting world. It demonstrates that specific needs based on identity and beliefs can be addressed through adaptive technological innovation. Modern consumers prioritise comfort when choosing sports hijabs, which includes the fabric's ability to regulate temperature, absorb sweat, and not cause irritation or discomfort when worn for extended periods (Liu et al., 2020).

Clothing can influence sweat production due to the nature of the fabric. Athletes can wear appropriate Muslim women's sportswear and use it as a single layer so that it does not affect sweat production or evaporation. This means there is no harm in wearing religiously-based clothing when competing in sports (Intan Ratu Permata & Daga, 2021).

CONCLUSION

Textile technologies such as moisture-wicking in hijab fabrics has been shown to make a significant contribution to the wearer's thermophysiological comfort, particularly in keeping the skin dry, cool and irritation-free during exercise. Moisture-wicking technology plays a vital role in enhancing the comfort of wearing a hijab for sport. Moisture-wicking technology has become the new standard in the development of modern sports hijabs. Continuous innovations in materials and design allow active Muslim women to exercise without compromising on comfort, skin health, or their sense of personal style. Sports hijab products from leading brands such as Nike have incorporated materials with the ability to absorb and evaporate sweat quickly, such as a blend of cotton, rayon, and polyester, designed with specialised knits or weaves. Findings also indicate that ergonomic hijab designs can minimise movement restrictions and boost the confidence of Muslim female athletes.

Fabrics with fibre structures that support air circulation and offer faster sweat absorption and evaporation, such as polyester with specialised technology, are an ideal choice for sports hijabs. Ergonomic and aerodynamic designs also play a crucial role in enhancing the performance and confidence of Muslim female athletes. Thus, the application of textile innovations in sports hijabs not only impacts comfort but can also support the achievement of peak performance in sporting activities.

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