

# Designing for Body Diversity: A Review of Strategies to Improve Clothing Fit and Comfort across Different Body Types

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## ABSTRACT

This article examines methods used to make clothes more accommodating to a wide range of body forms. Customers' happiness and the longevity of fashion labels depend on designers getting the details of fit and comfort just right. The article discusses the difficulties designers and manufacturers encounter when accommodating a wide range of body types. Fashion companies may better serve their clients by learning about the nuances of various body shapes and then creating creative ways to dress everyone. Methods for developing patterns with precise dimensions and sizes are explored. All body types may benefit from these methods, which will lead to more flattering and comfortable apparel.

**Keywords:** clothing fit, comfort, body types, sizing, measurements, pattern development, inclusive, fashion brands, customer satisfaction.

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## INTRODUCTION

Asking oneself, "What should I wear today?" This is a common inquiry that many individuals have every day. Clothes are vital to human survival. People are always looking for a new style that will boost their self-esteem. Good style is subjective, and it may be defined differently by different individuals and in different contexts. However, one thing about the human body has not changed: its form. Some individuals tend toward thinness, while others naturally have a curvier frame. The hourglass silhouette, with a waist-to-hip ratio of 0.7, was formerly considered the pinnacle of female fitness [1, 2]. Recent research indicated that the effect of social media has led to a wider variety of perspectives on body shape acceptance and self-images than was previously the case [3]. By showcasing celebrity trends and influencer looks, mainstream and social media significantly impact consumers' sense of identity. Therefore, customers believe they need flawless bodies since they do not fit into particular sizes.

Uncomfortable with their body shapes, consumers often blame themselves when clothes do not fit properly [4]. Therefore, one might deduce that cathexis, or one's attitude about one's body, is closely related to how well one's clothes fit [5].

Size suggestion websites like True Fit and Stitch Fix have been around since 2010, helping users identify businesses that carry their size by collecting clothing sizes and doing initial size screenings. However, in addition to personality and temperament, body type may ensure a good match physically and mentally. According to one research [1], for instance, 64 per cent of those who tried on ready-to-wear items had to return them because they did not fit properly. This included people of every body type except those with an inverted triangle physique. As online shopping has become more popular, customers have begun making purchases without first putting them on to ensure a good fit. Size and fit issues were the primary reason for the return of 34% of fashion items purchased on Amazon and 46% of fashion items purchased from other online retailers, according to research by Narvar [6]. The COVID-19 epidemic has increased the urgency of the necessity for virtual fitting. As a result, a slew of new businesses like Savitude (Savitude, n.d.) is springing up to give customers patterns explicitly designed for their body types using artificial intelligence (AI). Certain shapes are preferable to others for each body type in terms of aesthetic harmony and physical ease. The shape of an ensemble was revealed to be the deciding factor in consumer choice [7]. This is why it is essential for style suggestion algorithms to take into account things like clothing sizes and cuts. Several computer science researchers have investigated body shape-based styling frameworks by studying the clothing preferences of celebrities and identifying the correlation between body shape and clothing preferences [8]. Some studies use celebrity images [9], aesthetic characteristics [10], and real-time intelligent vision technologies [11] to collect data on garment attributes

from which style recommendations may be made. However, there has not been much study done to prescribe silhouettes for certain body types.

### LITERATURE REVIEW

Women often like and admire those with an hourglass form more than any other body type [12]. There are various cultural, historical, psychological, and sexual factors at play here. The goddess of beauty shown in the Birth of Venus was a popular subject for early painters. Some have argued that the hourglass figure visually indicates a woman's ability to have children [13].

One study concluded that Venus's physique represented the hope of perseverance and continuity even though her body type may not be typical of women [14]. The standards for a beautiful woman have changed throughout time and between cultures. In previous research, women with a BMI between 18.5-24.9 and a WHR below 1.0 were shown to have a better chance of living a long and healthy life.

A WHR in the 0.7–0.8 range has been shown to predict fertility across cultures [15] predictably. Particularly among young customers, social environment plays a role in determining the ideal body form and the preferred apparel fit. A complex web of influences goes into deciding on a new wardrobe. With the rise of social media and the influencer effect, unique ensembles and supportive comments from friends may sway a person's clothing size and style [16]. A recent survey by Statista [17] found that almost two-thirds of individuals in the United States regularly engage in social media. Some research has shown that sharing material from well-known figures on social media may influence consumers to purchase. It was also pointed out that the ideal body shape on social media tends to set the trend every so often [18]. More women opt for the unhealthier hourglass athletic buttock appearance rather than the recommended 0.7 WHR because of the rising number of fitness social media influencers. This means that customers' ideas of what constitutes a well-fitting article of clothing may evolve.

A well-defined waistline, a well-balanced physical profile, an emphasis on the slender form, and well-fitting clothing go a long way toward helping many women accomplish their goal of having a slimmer hourglass figure. Despite appearances to the contrary, the most attractive body type varies with the times, cultures, generations, and countries. White-collar women, for instance, sported a power-dressing style in the 1970s and '80s that widened their shoulders and created an inverted triangular shape. In the early 20th century, popular music and supermodels influenced fashion; as a result, women favoured looser-fitting blouses, higher-rise jeans, and a grungier, more feminine aesthetic [19]. Previous research on the connection between body size and aesthetic preference in clothes found that although body type did impact clothing choice, fit perception varied greatly by body type [20]. More excellent body covering and loose-fitting clothing are favoured in large sizes [20].

Furthermore, there was a strong correlation between physical types and desires for psychological fitness [21]. Fashion may profoundly affect how people feel and think about themselves, but it can also look different on various body types. Individuals' perceptions of how well they fit may be heavily influenced by social feedback, personal comfort, and social appropriation [22].

From a design standpoint, the first step in creating a particular garment style is settling on the shape. The silhouette is the overall shape created by the garment and the person wearing it. The most popular body type, as do cultural preferences and geographical locations, fluctuate with time. Chiton, a strip of cloth thrown over the shoulder to create a tunic shape, was the signature look in classical Greece (750-30 BC). Around the same time, during the Qin and Han dynasties of ancient China, clothing accentuated the breast area by being layered and draped to create an empire silhouette. During the Middle Ages in Europe, long, flowing dresses adorned with elaborate accessories were a common sign of a woman's devotion to God and her position in society, both favoured by the ruling nobility. Various shapes denoted various social classes until the Renaissance when more fitting and waist-emphasized clothing designs emerged.

Clothing silhouettes were developed using hand-drawn patterns and hand-cut tailoring needles before the industrial revolution of the 1840s. As manufacturing improved, people stopped buying clothes only to keep warm and began buying them because they looked good [23]. Up to the Art Deco period, it was common practice to create the curve by highlighting the hip-to-waist ratio. The avant-garde movement was inspired by designers like Coco Chanel, Paul Poiret, and Jean Patou, who sought to streamline the layered curve shape and gender-neutral form [24]. After World War II, the hourglass silhouette gave way to more natural forms that emphasized a woman's curves. Punk and Gothic fashions, for example, emerged as countercultural responses to mainstream influences in music, art, literature, and cinema. In recent years, designers like Issey Miyake and Rei Kawakubo, who are known for their versatility and subversion, respectively, as well as Iris Van Herpen, who is known for her inventive use of technology, have developed a wide range of avant-garde shapes.

## FASHION RECOMMENDATION SYSTEMS

### *A. Overview of recommendation systems*

The COVID-19 epidemic has increased the need for internet-based storefronts. The fashion industry thrives online, accounting for 23% of all internet sales [17]. There are so many possibilities for online apparel retailers that a recommendation system is necessary to help customers narrow their choices. The financial and technological components of developing recommendation systems are both complex and expanding rapidly. With the proliferation of internet-based commerce, recommendation algorithms have found widespread use. Typically, information on customers, products, and markets is used to develop recommendation systems. With its proactive display of tailored content through algorithmic suggestions based on user interaction data, TikTok, for example, has attracted billions of users [25]. It is widely agreed that in the late 1970s, a librarian system called Grundy was the first recommendation system research. Since then, there have been many research papers and consumer goods dedicated to developing similar recommendation systems like Tapestry, Ringo for Music, MovieLens, etc. When searching for specific information among several options, a suggestion system may be used as a filter to save time and increase accuracy. Top recommendation system methods include collaborative filtering, content-based filtering, and hybrid models. Online marketplace with the most users. In 1998, Amazon filed for a patent on its collaborative filtering method, which uses data from other customers to provide product recommendations [26]. Initially, Netflix used content-based filtering to suggest shows and movies to users based on their viewing history. A content-based recommendation system's predictive ability is more remarkable since it draws on more user data. A practical suggestion system gives Customers a more tailored shopping experience and reduced mental strain. Implemented and extensively utilized across various digital environments, recommendation systems help companies maintain the interest of their target audience and grow to a larger scale. Privacy issues, doubts about the reliability of the underlying technology, and the risk of encouraging unethical business practices are only some potential drawbacks of using a customized recommendation system.

### *B. Garment size recommendation systems*

There is a growing movement in business and academia to find solutions to the difficulties of finding the right size when shopping. The hybrid recommendation approach used by True Fit, a data-driven size recommendation tool, allows for comparing brand-specific sizing variations and the subsequent prediction of the optimal size for online buyers. It considers production statistics, brand sizing standards, and previous purchases to recommend a suitable size. Companies like Fit Analytics, FIT: MATCH, and Virtusize also used multi-dimensional data analysis to determine an individual shopper's optimal size. To improve online sales and decrease unwanted returns, Fit Analytics analyzed buyer demographics and product information (Fit Analytics, 2018). FIT used a 3D scan of a person's body: MATCH to determine the accuracy of the sizing prediction (FIT: MATCH, 2018). Proper Fit and other such solutions help retailers cut down on returns because of wrong sizing. Thanks to size prediction technologies, customers may feel more at ease with their purchases. Customers liked the safer sizing options provided by these suggestions. [27].

### *C. Garment style recommendations*

Online and physical stores both benefit significantly from recommendation systems. As the fast fashion industry continues to explode, consumers may feel overwhelmed by the sheer volume of new clothing designs on company websites daily. In the early 2000s, fashion stores began using style suggestions to assess buyer profiles and garment detail databases in an effort to improve shopping experiences and return on investment (ROI). Companies like Amazon, Shein, Alibaba, Pinterest, TikTok, Instagram, and Facebook, which combine e-commerce with social media, are the newest significant players in advising customers on fashion trends and styles. StitchFix, which filed multiple patents in 2016, has developed one of the most sophisticated algorithms for proposing clothing based on various factors (Stitch Fix Algorithms Tour, 2021). StitchFix can build cutting-edge machine learning projects and construct a data-driven supply method because of its detailed information about its customers' tastes and body types. Successful recommendation systems are competitively configured to enhance corporate value (CB Insights, 2022). Other rivals include Trunk Club, Gwynnie Bee, Le Tote, and more. Numerous scholarly works have examined style recommendation systems from various angles, such as data analysis, computer algorithms, and vision analysis. By studying keywords of the dressing state and visual interpretation of clothing, Geo-Style [2] constructed an algorithm for predicting future fashion trends.

A Siamese Convolutional Neural Network (CNN) architecture was tested inside a styling suggestion framework based on visual compatibility between paired clothing categories to produce outfit combinations. Other machine learning algorithms took into account the user's taste, the impact of social media, and the context of the purchase to get a more accurate prediction of the popularity of clothing items.

## CONCLUSION

Fashion companies have a complex and crucial problem in designing clothes that flatter a wide range of body shapes while fitting comfortably. In order to improve the clothing-buying experience for people of varying body types, our analysis has indicated several approaches that may be used. A better fit may be achieved with the help of precise size

and measurements, which serve as a basis for developing clothing that is in harmony with the distinctive proportions of each body type. Pattern-creation methods may also be used to make clothes more comfortable and suitable for a broader range of body types and sizes.

Fashion companies may do more to make their products accessible to people of all shapes and sizes by embracing diversity and learning more about their customers' needs and preferences. A brand's success depends on its ability to keep its customers happy. Therefore, they must understand that people of all shapes and sizes need and deserve clothes that fit them properly.

More work has to be done in this area so that clothes fit and feel well on people of various shapes and sizes in the future. New methods of measuring and analyzing body shapes and sizes, such as 3D body scanning and virtual fitting, are being investigated. By working together, the design, manufacturing, and customer communities may learn invaluable information about individual fit difficulties and preferences.

Finally, fashion firms can transform the garment business and make shopping more fun and satisfying for people of all body types by adopting these techniques and focusing on inclusion.

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