

1.1 Introduction

Our appearance is our most apparent individual characteristic. Although we are taught that we should not judge others by their appearance alone, relying on appearance to guide personal decisions and social interactions is not only natural, but inescapable.¹ The body and the way it is clothed and presented is a primary medium of expression, for it makes statements on the condition of society itself.²

Few people have a perfect body. Most people would like to improve their appearance with appropriate clothing, by camouflaging their less desirable attributes and highlighting the more attractive aspects of their bodies.³ In order to design garments to present the best image of the wearer, it is necessary to understand the perceptions of beauty, body attractiveness and body image as well as how the perception of body appearance can be modified through clothing.

1.2 Beauty

What is beauty? Are there properties possessed by an object which count towards beauty in all cases and which are sufficient or necessary for an object to be judged beautiful? One school of thought is that 'beauty is in the eye of the beholder', that individual attraction is a result of personal experience, cultural background and specific circumstances. Naomi Wolf, in her book, *The Beauty Myth*, argues that there is no such thing as a quality called beauty which exists 'objectively and universally'.^{4,5} Some modern philosophers also believe that there are no principles of beauty, although there is a rational basis for genuine judgement of beauty.⁶ They argue that it is always possible to find an object which can be judged to exhibit principles identified as those of beauty but which does not evoke a pleasurable response, and conversely there may be objects which are experienced as beautiful but which do not exhibit the identified principles. Nevertheless, the assumption that beauty is just an arbitrary personal



Flower



Insect



Dress



Architecture

Figure 1.1 Golden ratio in nature, design and architecture. Source: Photographs by courtesy of Dr. Eddy Levin, London. <http://www.goldenmeangauge.co.uk/golden.htm>

preference may simply not be true. It cannot explain the fact that even two-month-old infants prefer to gaze at faces that adults find attractive.⁷

If there are universal principles of beauty, what are they? Ancient Greeks believed that the world is beautiful because there is a certain measure, proportion, order and harmony between its elements.⁶ For centuries, the Golden Ratio or Golden Proportion, a ratio of 1:1.618 has been considered as the perfect ratio for beauty (see Fig. 1.1). It can be seen in nature and is used for art and architectural design. Linguists discovered that, although the same sound may mean entirely different things in different languages, there is a universal grammar underlying the combination of the sounds.⁸ Similarly, it has been

suggested by many philosophers that beauty stems from the relationship between the elements comprising the whole.⁹ Evidenced from the rhyme of music and poetry, philosophers in the twentieth century realised that such beauty is likeness tempered with difference or the fusion of sameness and novelty. Modern psychologists¹⁰ and biologists⁹ have echoed such a claim. They found that men and animals, exposed for some time to a particular sensory stimulus, prefer new stimuli which are slightly different from the one with which they are familiar. 'The likeness tempered with difference' is pleasing to the classification process, which is important for biological survival.⁹

1.3 Facial attractiveness

What would a universally beautiful face look like? Galton in his pioneering paper of 1878 reported an important discovery that a composite face produced by superimposing different photographs of faces is more attractive than any of the individual photos, suggesting that facial beauty relates to averageness. This hypothesis was tested and confirmed by Langlois and Roggman in 1990, who used a computerised version of the technique developed by Galton.⁷ The principle of 'averageness being attractive' has a biological foundation. It was proposed by biologists that, during most periods, evolutionary pressures operate against the extremes of the population.¹¹ People with average physical properties have the best chance of survival, and therefore people tend to be attracted to, and mate with, partners having average features.

However, averageness is not the only criterion for beauty. Rhodes *et al.*¹² found that facial symmetry is also important. Attractiveness increased with an increasing level of symmetry. The preference for symmetry also has a biological reason. Apart from averageness and symmetry, some extreme traits, such as the peacock's tail, can be a sign of quality and health in a mate and therefore favoured in the selection process. Using composites of both Caucasian and Japanese faces, Perrett *et al.*¹³ showed that the mean shape of a set of attractive faces is preferred to the mean shape of all the faces in a sample. Attractive composite faces can be made more attractive by exaggerating the shape difference from the sample mean. Therefore, an average face shape is attractive, but not optimally attractive. Human preferences could exert a directional selection pressure on the evolution of the shape of a human face.

Perrett *et al.*¹⁴ further showed that more feminine female faces are preferred to average faces. A more feminine male face is also preferred above the average and masculine faces. Enhanced masculine facial characteristics increased both perceived dominance and negative attributes (for example, coldness or dishonesty) relevant to relationships and paternal investment. This preference applied across UK and Japanese populations but was stronger for within-population judgements. They believed that humans have a selection pressure that limits sexual dimorphism and encourages neoteny.



Figure 1.2 Beautiful faces fitted with beauty masks. Source: <http://www.bbc.co.uk/science/humanbody/humanface/beautygolden.mean.shtml>

The beauty of a face has also been measured by Marquardt,¹⁵ who claimed that beautiful faces of all races (including babies) fit his 'Universal Beauty Mask', which is mathematically created from the Golden Ratio (see Fig. 1.2). The degree of conformance of one's face to the 'Universal Beauty Mask' is a measure of beauty.

1.4 Body physical attractiveness

The classical average Greek body proportions have been widely considered as ideal for centuries.³ The Greek ideal male and female figures are shown in Figs 1.3 and 1.4, respectively. The various body dimensions are measured in the unit of head length. For both the male and female, the height is approximately seven and half head lengths, with the fullest part at the hipline and wrist level dividing the total length exactly in half. The neck is about one-third the length of the head, and the shoulder line slopes a distance of a half head length from the level of the chin. The fullest part of the bust or chest is located two head lengths from the crown. The waistline, which coincides with the bend of the elbow, is two and two-thirds of a head length from the crown. The knees are five and half head lengths from the crown and the ankles are seven head lengths from the crown. Male and female proportions differ only in circumference ratios. For the ideal female, the width of the hip frontal view is almost the same as the shoulder width. The shoulder width of the ideal male is greater than the width of his hips. There is also a greater difference in the depth ratios from front to back in the female figure than there is in the male with respect to bust/waist and waist/hip relationships.

Despite the wide appeal of the average Greek body proportions, the concept or perception of beauty ideals has never been static. It varies from time to time and from culture to culture. From the fifteenth to the seventeenth centuries in western cultures, a fat body shape was considered sexually appealing and fashionable. The ideal woman was portrayed as plump, big-breasted and maternal. By the nineteenth century, this had shifted to a more voluptuous,

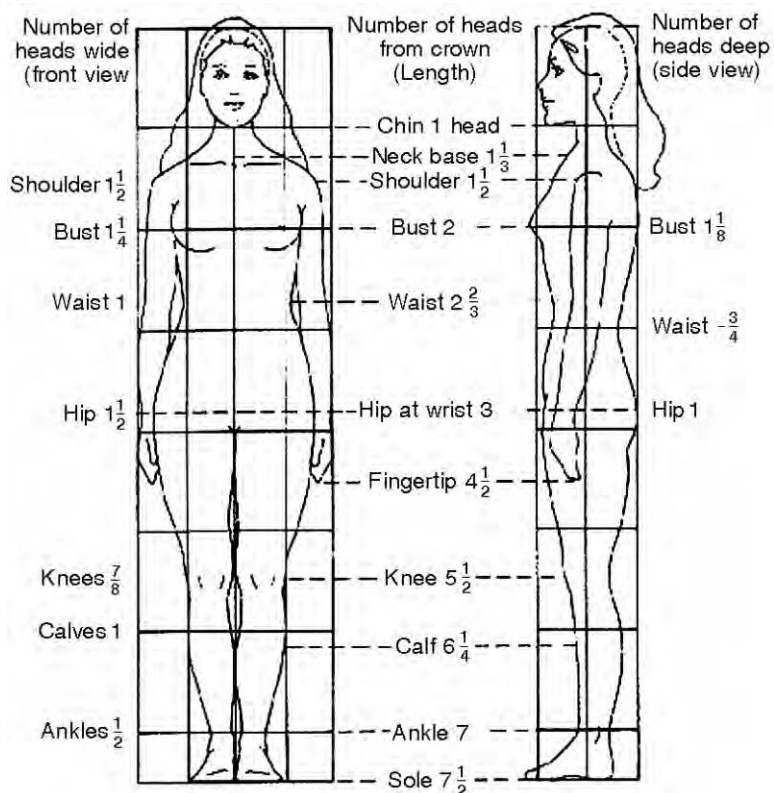


Figure 1.3 Ideal Greek proportions of female figure. Source: Horn M. J. and Gurel L. M. (1981). *The Second Skin*, Third Edition. Copyright (© 2003 by Fairchild Publications, Inc. Reprinted by permission of Fairchild Books, a division of Fairchild Publications, Inc.).³

corseted figure, idealising a more hourglass shape. In modern western culture, thinness coupled with somewhat inconsistent large breasts and a more toned, muscular physique has become the ideal of feminine beauty.¹⁶

In addition to historical factors, cultural differences play a significant role in the concept of beauty. For example, traditional Chinese culture associates plumpness with affluence and longevity, and Arab cultures associate greater body weight with female fertility.¹⁷ Yu and Shepard¹⁸ investigated the female body preferences of the culturally isolated Yomybato village in southeast Peru and discovered that the female body preferences of the Yomybato males are strikingly different from those prevalent in the modern western culture. Yomybato males ranked the 'over-weight' female figure as most attractive, healthy and preferable for marriage (see Fig. 1.5).

Evolutionary psychology suggests that female physical attractiveness is based on cues of health and reproductive potential. Two putative cues to female

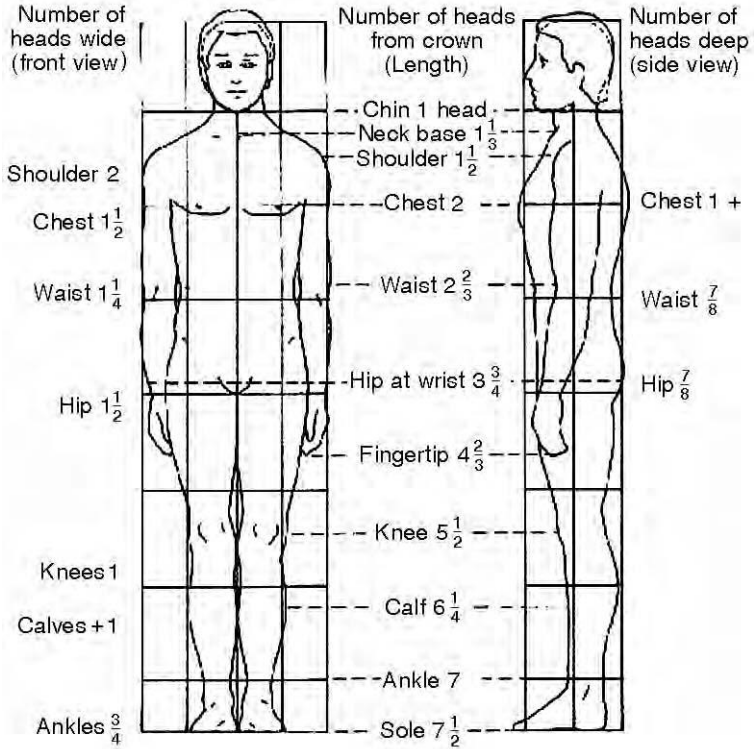


Figure 1.4 Ideal Greek proportions of male figure. Source: Horn M. J. and Gurel L. M. (1981). *The Second Skin*, Third Edition. Copyright (© 2003 by Fairchild Publications, Inc. Reprinted by permission of Fairchild Books, a division of Fairchild Publications, Inc.).³

physical attractiveness are shape (particularly the waist-hip ratio or WHR) and body mass index (BMI). Earlier researchers believed that a low WHR (i.e. a curvaceous body) corresponded to the optimal fat distribution for high fertility and hence female attractiveness.^{19,20,21} However, recent studies by Tovee and co-workers^{22, 23} have shown that the body mass index (BMI), rather than WHR, is the primary determinant of female attractiveness. Tovee *et al.*²³ confirmed their findings by deliberately using a set of body images which has an inverse correlation between BMI and WHR. Nevertheless, Tovee *et al.*²³ and other earlier researchers have not tested their findings on 3-D female images. In a recent study by Fan *et al.*,²⁴ 3-D images of 31 Caucasian females, having varying body weights (BMI ranged from 16 to 35), were shown to 29 male and 25 female viewers, who were asked to rate their physical attractiveness. The results showed that the body volume divided by the square of the height, defined as volume height index (VHI), is the most important and direct visual determinant of female physical attractiveness. Figures 1.6(a) and 1.6(b) plot the

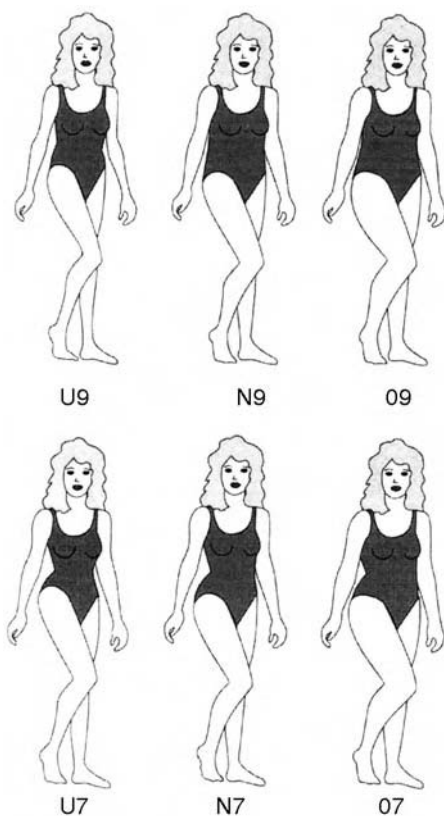


Figure 1.5 Female body figures having varying WHR. Source: Singh 1993.²⁰

relationship between $\log(\text{VHI})$ and $\log(\text{AR})$ (i.e. the logarithm of attractiveness rating) for male and female viewers, respectively. VHI accounted for about 90 per cent of the variance of attractiveness ratings. Other parameters which affect body attractiveness include WHC (the ratio of waist height over the chin height) and AWHR (the deviation of the ratio of waist over hip from the ideal ratio). This suggested that human observers may first use VHI as a visual cue, which is also a key indicator of health and fertility due to its strong linear relation to BMI. To fine tune the judgement, observers may then use body proportions. Fan *et al.* further showed that there could be perceptual reasons for humans to use VHI or the associated BMI to determine body attractiveness and fit. They also showed that the effect of the body physical parameters on the perception of female physical attractiveness appears to conform to Stevens' power law of psychophysics.²⁴

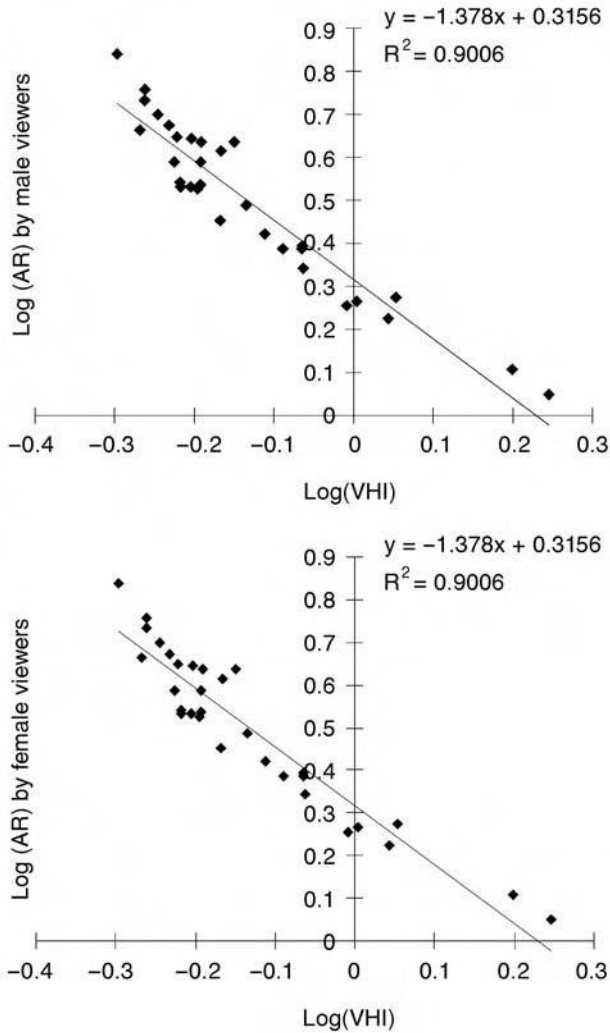


Figure 1.6(a) Plot of $\log(\text{VHI})$ versus $\log(\text{AR})$ by male viewers; (b) plot of $\log(\text{VHI})$ versus $\log(\text{AR})$ by female viewers. Source: Fan *et al.* 2004.²⁴

1.5 Body image

The internal representation of one's own outer appearance, i.e. perception of one's own body, is termed body image.¹⁶ Body image is important as it is strongly related to self-esteem and the development of personality attributes.^{25,26} A positive view of one's own looks may heighten one's self-esteem and leads to bold, successful interpersonal or business ventures, whereas a poor view of the physical self may weaken one's confidence.

Research on body image can be traced back to the beginning of the twentieth century, when the association between body image and brain damage was identified by neurologists and neuropsychologists. Subsequently, researchers realised the multidimensional nature of body image, namely that body image is attributed to both conscious and unconscious factors, such as emotions, attitudes, wishes and social relationships. Studies on the self-perception of body appearance began in the 1940s. Between the 1940s and the 1950s, numerical scales were designed to self-rate the perception of body attractiveness and appearance. It was found that a high percentage of women were dissatisfied with their body. From the 1960s, increasing evidence has been found that body image affects eating disorders and mental distress. The neurological basis and clinical aspects of body image are beyond the scope of this book, but the reader is referred to the literature review in this area by Thompson *et al.*¹⁶

Schematic figures or silhouettes of varying sizes, from thin (underweight) to heavy (overweight) are widely used for assessing body image. The subjects are asked to pick out the ideal figure and their conception of the figure that most closely matches their own. The difference is a measure of the satisfaction with one's own body (i.e. body image). The frequently used figural scale is the nine-figural scale developed by Stunkard *et al.*²⁷ The lack of consistent gradations of the figures of such figural scales were pointed out as a potential source of error.²⁸ Thompson and Gray²⁹ advocated their own nine-figural scale (see Fig. 1.7), which has similar differences in adjacent figures. Gardner *et al.*³⁰ later described the careful development of two scales, a two-figural scale and a thirteen-figural scale. However, Stunkard³¹ argued that the two new scales have no greater validity than the previous scales as demonstrated by the correlation between scale values and measured values of body mass index and weight. Another potential problem with a standardised figure rating is that the subject may find that none of the sizes and dimensions reflected by the figures match their own. Subsequently, computer programs have been developed to allow subjects to change the figure freely until it matches their own body.³²

1.6 Modification of body appearance by dressing

1.6.1 Interaction between viewer, environment, body and clothing

The appearance of the clothed body is a perception of the viewer (whether of the wearers themselves or others) in a social and climatic context. It involves interaction between body, clothing, the viewer and environment (see Fig. 1.8). In mathematical terms, the appearance is a complex function of body, clothing and environment (including social, cultural and other norms). Such a visual unit has been appreciated by DeLong,³³ who defined the interactive unit as Apparel-Body-Construct. Viewing an Apparel-Body-Construct is not just to scan and

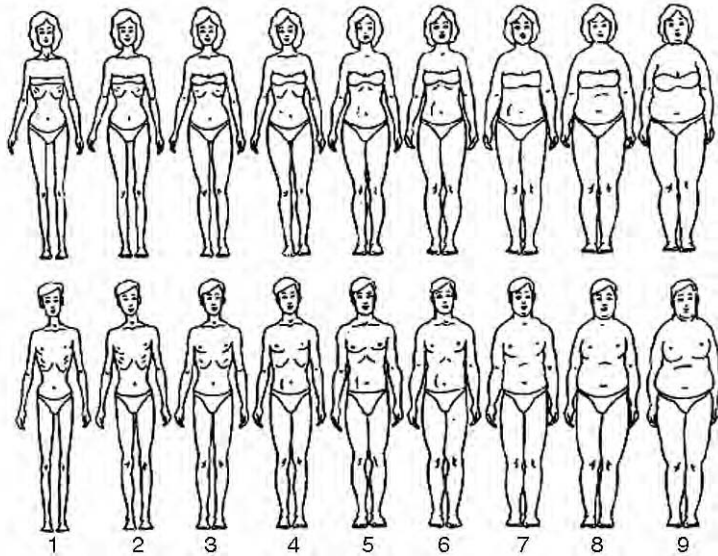


Figure 1.7 Nine-figural scale of Thompson and Gray, 1995.²⁹

understand the visual components, such as line, shape, colour, texture, body shape, etc., which has its own meaning and expressive characteristics, but to perceive the contextual relationship between the components. DeLong³³ pointed out that the perception of clothing appearance is influenced by the Gestalt effect, that is the whole is more than the sum of its parts. For example, the same jacket may appear different depending on what garments are combined with it.

1.6.2 Changes in body cathexis

Satisfaction with body appearance and its separate parts is termed as 'body cathexis'. Body cathexis is an evaluation of body image and self concept. A low

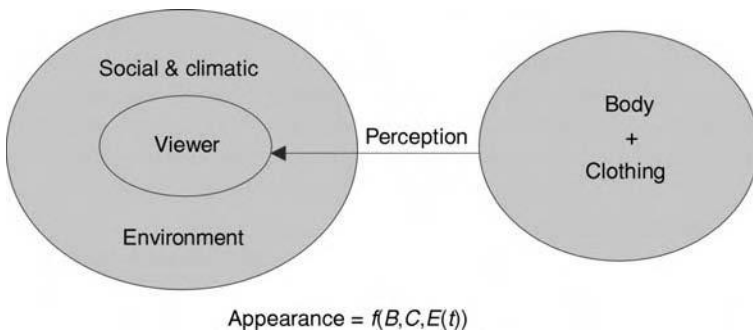


Figure 1.8 Interaction between viewer, clothing, body and environment.

value of body cathexis indicates dissatisfaction with one's own body appearance.

Body cathexis is highly related to the satisfaction of the fit of the clothing. It was reported that normal weight groups were most satisfied with their body and clothing fit.³⁴ The overweight group showed much less satisfaction with their body and clothing fit. McVey³⁵ found that ill-fitting branded garments which are expensive and fashionable give a message to the consumer that something is wrong with their body. However, less fashionable and less expensive private label merchandise does not carry the prestige to affect the consumer's opinion of their own body. LaBat and DeLong studied the body cathexis and the perception of clothing fit of 107 female consumers.³⁴ They found a strong correlation between body cathexis and satisfaction with clothing fit. Markee *et al.*³⁶ investigated the body cathexis of the nude body and the clothed body of 29 working women. They found that these working women were significantly more satisfied with their clothed bodies than with their nude bodies, showing the importance of dress in enhancing the perception of body appearance.

1.6.3 Illusion created by dress

The principles of illusion can be applied to the design of dress so as to camouflage the undesirable body attributes and to make the person's appearance closer to the ideal. Horn and Gurel³ have shown that, for a shorter figure with a sloping shoulder, the Muller-Lyer principle can be applied to create an appearance of increased shoulder width and body height (see Fig. 1.9). Design A in Fig. 1.9 can make the wearer look closer to the ideal proportion. A slender figure can be made fuller by adding fullness at the bustline and hipline and reducing the visual width of the waistline. A short figure can look taller by minimising horizontal lines in the design. In general, parts of the body which are judged to be too large can be subdivided into smaller areas or counterbalanced by increasing the visual size of the surrounding elements. Body proportions which are considered too small may be masked or increased in size through the use of perspective and gradient techniques, or by minimising the size of adjacent elements.

Fan *et al.*³⁷ conducted an experimental investigation into the effect of garment size on the perceived body size. The perceived body sizes of three Chinese males (thin, medium and obese build) wearing different sized white T-shirts were assessed. Within the limits of commercially available T-shirt sizes, it was found that, for thin and medium build persons, the perceived body size is bigger when wearing T-shirts in a larger size. However, for an obese person, wearing a large size T-shirt tends to make him look thinner (see Fig. 1.10).

The perception of human faces may also be changed by hair styles and collars. For example, a round face may look better in a straight pointed collar and a square face may look better in a large collar to achieve the illusion of an oval face, which is the ideal in western culture.³⁸

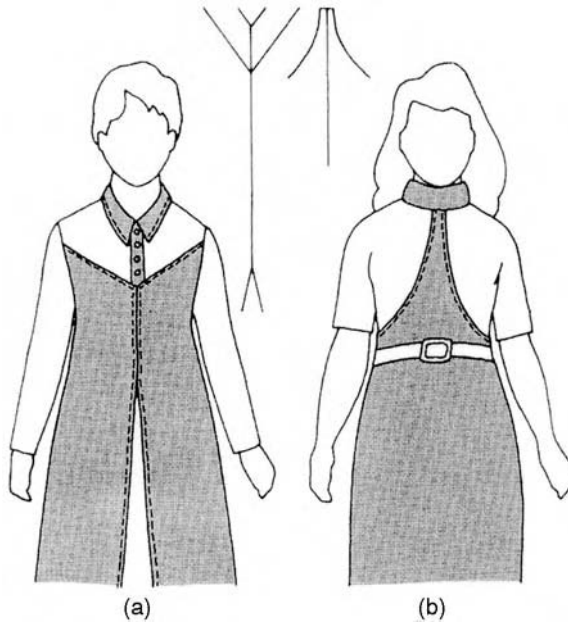


Figure 1.9 Effect of design on the perception of body proportion. Source: Horn M. J. and Gurel L. M. (1981). *The Second Skin*, Third Edition. Copyright (© 2003 by Fairchild Publications, Inc. Reprinted by permission of Fairchild Books, a division of Fairchild Publications, Inc.).³

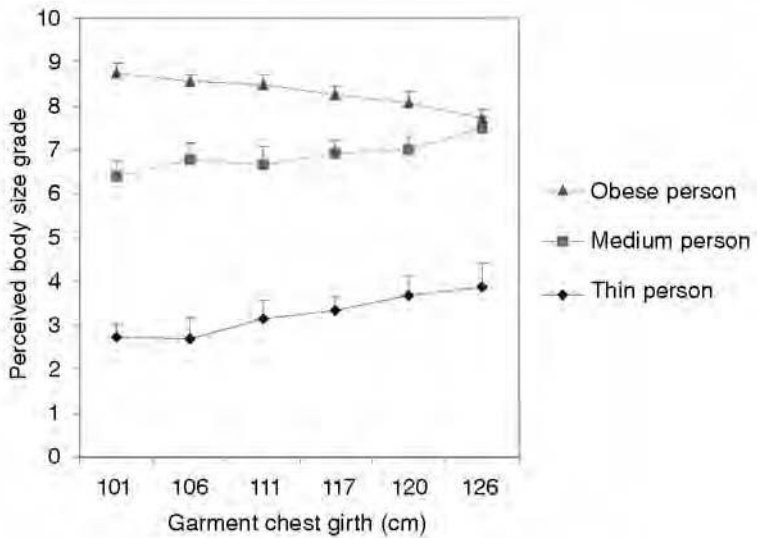


Figure 1.10 The perceived body size grades of the thin model, medium model and obese model.

Davis³⁹ summarised the visual design principles, such as repetition, parallelism, radiation, gradation, etc., and provided ‘recipe-style’ guidelines for manipulating fabric texture, style, lines, decorative details, shape, form, colour, pattern, etc., to achieve the desirable visual appearance.

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