

Fittability and Appearance of Brassiere Taking into Account Individual's Verge Line of Bust in Pattern Making

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Abstract

To investigate the effect of the verge line on the appearance of brassieres, the difference in the verge lines of individuals with the same brassiere size was examined. A new method for designing a brassiere was proposed, taking into account the individual's verge line using a computerised pattern-making system. Three different brassieres were made by changing the verge line of three dummy models (nine different brassieres in total). It was found that the verge line of the bust could differ even for the same bust size. Brassiere patterns and brassieres were made using the proposed design method and it was found that the verge line affected the bust cup shape and the appearance of the brassiere.

Keywords: Brassiere; Verge Line; Bust; Appearance; Individual

1 Introduction

Women commonly wear brassieres for cultural reasons and to modify the aesthetic appearance of the breasts. In addition to changing the shape of the breasts, the basic functions of a brassiere includes providing support and protection to the breasts. There have been several studies on the characteristics of the brassiere. Liao et al. [1] proposed a statistical technique to design and customise brassiere products. Cha [2] examined the uplifting effect of a prototype brassiere developed for Chinese women in Shanghai, China. Xue et al. [3] assessed the emotion conveyed by a brassiere, using the technique of Kansei engineering. They showed that the colour was the most important factor when designing a brassiere; in particular, the brassiere's base colour decides the basic emotion conveyed by the brassiere. There have also been studies on the factors affecting a brassiere's appearance and comfort. The shape of a brassiere varies depending on the

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breast volume and the pattern pieces. Inui et al. [4] investigated the internal three-dimensional (3D) structure of the breasts, which was not measurable previously for a woman in a sitting position, using a vertical Magnetic Resonance Imaging (MRI) system. Additionally, the effect of wearing a brassiere was assessed in terms of the relation between the external deformation and the internal structure of the breasts. McGhee and Steele [5] investigated a range of breast volumes and showed that the band sizes of women who have the same volume and cup size of brassiere differ depending on the individual. Wang et al. [6] proposed a method of predicting the amount of personalised brassiere cup dart in a 3D virtual environment. They simulated personalised female breast shapes and various aesthetic breast forms sculpted using different brassieres. Moulding of the brassiere cup has been investigated in several studies [7-10]. The factors of moving comfort have also been investigated. Zhou et al. [11] proposed a new method of evaluating 3D breast motion using a new breast coordinate system for a sports brassiere. Wang et al. [12] investigated the effect of the pressure distribution of different fabrics on the side straps and elastic hems of the brassiere. They showed that the clothing pressure increases with the increasing tensile resistance of the side-strap material. As described above, the sizes and shapes of brassieres differ depending on the individual body. In Japan, a woman purchases a brassiere taking into account the bust and under-bust sizes on the basis of Japanese Industrial Standards (JIS) L4006 [13]. In the JIS, a brassiere size is decided according to the difference between the girths of the under-bust and bust. The girth of the bust is measured passing the nipples of the bust whereas the under-bust passes underneath the breasts. The difference between the two girths (2.5 cm) is referred to as the cup size and classified in JIS as A, B, C, and so on. For example, if the under-bust size is 65 cm and the bust size is 80 cm, the brassiere size will be C65. According to a survey on the purchase of brassieres [14], 50% of Japanese women in their twenties to fifties purchase their brassieres according to the size without trying them on. In the survey, 33% of the respondents mentioned a poorly fitting verge line as a problem with the fitting of a brassiere. In addition to the bust size and under-bust size, it is said that the length and shape of the verge line of a bust vary depending on the individual. The verge line of the bust is the cross-sectional outline of the part connecting the bust and body as shown in Fig. 1. A brassiere usually has a wire running along the verge line. The wire length and shape should be decided according to the length and shape of the verge line of the bust. Thus, the wire length and shape need to be considered when designing a more comfortable and beautiful shape of the brassiere [14]. Lee et al. [15] scanned women's nude breasts using a 3D phase-shifting moiré and explored a measurement protocol with which to get a reliable boundary of the breast and thereby provided new shape parameters for breasts. The global average radius of the curvature of the bottom breast line was suggested as a useful shape parameter for the design of a comfortable and form-fitting brassiere. Lee et al. [16] also evaluated the performance of eight brassiere wires for different under shapes of women's breasts. They showed that the fitting of the global average of the radius of curvature of the wire to that of the bodyline of the under-breast curve was an important variable in the design of wires. However, the effect of the verge line on the appearance of brassieres is not clear, especially for the individual. Even in the case of women who have the same under-bust and bust sizes, the verge line can differ. It is thus necessary to take into account the verge line in designing a fitted brassiere for an individual. Therefore, we investigated the difference in verge lines for the individual bust for the same brassiere size. Furthermore, we proposed a new method of designing a brassiere taking into account the individual verge line using a computerised pattern-making system. We made three brassieres with different verge lines. By comparing their appearances, we investigated the effect of the verge line of busts of the same size on the brassiere appearance for the individual.