

Analysis of Pressure Distribution of Brassiere's Under Wires

Li-Zhuo Wang^{1,2}, Dong-Sheng Chen^{1,3*}, Bin Lin²

¹College of Textile and Clothing, Jiangnan University, China

²Zhejiang Textile and Fashion College, China

³Institute of Textile and clothing, Minjiang University, China

Abstract: To find out the distribution of pressure on brassiere's under wires, two tests of under wires were done using AMI-3037 Air-pack type contact surface pressure measuring system. The brassieres used were commercial brassieres. In test 1 (T1), three different styles of brassieres were all 75A in size and each piece is tested by the same subject (S1). In test 2 (T2), a brassiere of 75A size was tested by three different subjects (S1, S2, S3). Three subjects were healthy unmarried women of age group 22 to 26 years. Seven points were measured in T1. Four points were measured when the subject made four different poses in T2. The results indicate: 1) There are three different pressure distributions in T1; 2) The pressure values are affected significantly at different points, brassieres, the interaction of points and brassiere, the interaction of points and subjects; 3) Most pressures of center front are larger and most pressures of the lowest point are small at the under wires; 4) The pressure values change while breathing. The range of most pressure values is between 0 and 0.5kPa except few ranging from 0.5 kPa to 1.5 kPa. 5) The shape of under wires is an important factor in healthcare of women.

Keywords: Under wire, brassiere; pressure, distribution, comfort, under breast curve.

1. Introduction

As one among the skin-tight clothing, brassieres are studied by more and more countries recently [1]. The main effects of brassiere are shaping curves of female's breasts, protecting and supporting breast. There are varied brassieres in the markets now, such as common brassieres, sports brassieres, sleeping brassieres, seamless brassieres, nursing brassieres, and so on. The structure of brassiere is mainly composed of gore, under wires, cups, shoulder straps, torso straps and decorations [2,3]. Most of daily brassieres include under wires because they can support the lower part of breasts and shape better breasts' curve. The main materials of the under wires are steel, rigid plastic and other materials that are not easily deformed.

The comfort degree of brassiere wearing is affected by the shape of under wires directly when choosing and purchasing brassieres. The shape of the under wires should be conformed to the lower curve of the breast base line, otherwise it will be felt like under wires move up or press breasts. If women wear the in appropriate brassiere, the under wires will press their galactophores, blood vessels, nerves, lymphatic and other organs. The long-term pressure of the under wires will lead to pathological changes of breasts, such as hyperplasia of mammary glands, mastitis, nipple

discharge, etc.

More and more studies have been reported on the pressure made by brassiere and the measurement of breasts [4-8]. However, there is a little information available on the analysis of pressure distribution and comfort of brassiere under wires.

2. Experiment

2.1 Brassieres and Subjects

In the test 1 (abbreviated as T1), the main purpose is to test the effects of different brassieres' under wires on the same subject. So, three different brands of commercial brassieres were used. They were all 3/4 cups and 75A size. And their styles are similar. The subject was a healthy woman of 24 years of age. Seven test points along the curve of under wire at right breast were tested. The style of brassieres and test points are shown in Figure 1.

It was found that the under wires of three brassieres were different when compared according to their shapes where the lowest points of three under wires were superposition [9]. The shapes of three under wires are shown in Figure 2.

*Corresponding author's email:mjuchen@126.com
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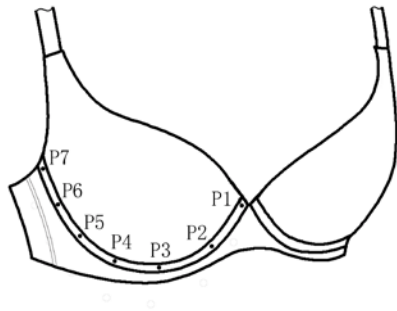


Figure 1 The style of brassieres and test points in T1.

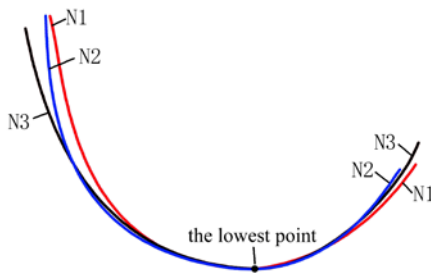


Figure 2 The shapes of three under wires.

In the test 2 (abbreviated as T2), the main purpose is to test the influence of different subjects and motions on the pressure values of under wires. Two commercial brassieres were used. They are all 3/4 cups and 75A sizes. Three subjects were healthy women in age group 22 to 26 years . Four test points along the right side of the under wire were tested when the subjects made four different poses including standing, sitting down and relaxing, stretching arms forward and raising up the arms. The style of brassiere and the test points are shown in Fig. 3.

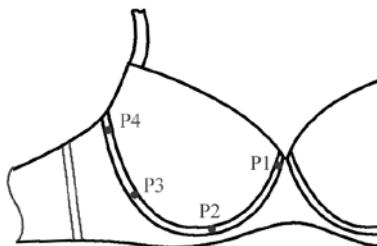


Figure 3 The style of brassiere and the test points in T2.

The differences between two tests were more clearly compared by their test items. The details of T1 and T2 are shown in Table 1.

Table 1 The details of T1 and T2

Item	test	
	T1	T2
Brassiere	B1; B2; B3	B4; B5
Subject	S1	S1; S2; S3
motion	None	M1; M2; M3; M4

2.2 Measurements

The pressure values were measured using AMI-3037-5S Air-pack type contact surface pressure measuring system [10-11]. The principles of the measuring system are shown in Figure. 4. The temperature and humidity were at $25 \pm 2^\circ\text{C}$ and $65 \pm 2\%$ in the laboratory, respectively.

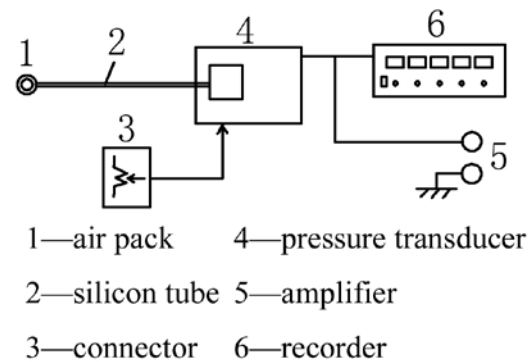


Figure 4 Measuring system of clothing pressure.

3. Results and Discussion

3.1 The Details of Subjects

Table 2 shows the basic information of subjects in T1 and T2. The subject “S1” was tested in both T1 and T2.

3.2 Pressure Values in T1

Figure 5 shows the pressure values of seven points when the subject was standing naturally in T1.

Univariate analysis was performed using the scores in Figure 5 in order to find out the significant differences of different points and brassieres in T1. The significant values of points and brassieres (significance level, 0.05) are shown in Table 3.