體型分析

Body Shape Analysis

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摘要

在服裝產業中，所謂的量身訂製程序指的是，使用布尺的裁縫師根據特定客人的尺寸及體型，將衣服製作及修改成為具合身度的服裝。目前，有部分的美國製造廠商及零售業者採用 3D 人體掃描器及服飾電腦輔助設計(CAD)系統去進行這個量身訂製服的程序。雖然，3D 人體掃描器能夠將人體各部位的尺寸很準確地加以量測，但產業界仍然很難製作出具合身度的客製服，而造成合身度問題的主要癥結就是缺乏有關體型的資訊。所以，本研究調查大學女性對於他們體態及特殊體型的認知，畫有五種體型的問卷發給參與者，讓他們自己圈選最能代表他們體型的圖片。結果顯示，大部分參與者認為他們的體型是屬於標準體態，然而，具有代表性的特殊體型分別為漏斗形體態、垂肩型、平背及前傾型的站姿。這些體型的相關訊息可以使 CAD 軟體設計師了解體型差異及體型對紙版的影響，而最終廠商能製造出高合身度的訂製服。

關鍵詞：體型、紙版修正。

ABSTRACT

In the apparel industry, the customized process is referred to clothing made and altered by tailors who use measuring tapes. Instead of using measuring tapes, few apparel manufacturers and retailers have applied apparel technologies including 3-D body scanners and Apparel Computer Aided Design (CAD) systems in this made-to-measure process. Although 3-D body scanners are capable of extracting precise body measurements from human bodies, it is still hard for the industry to create customized garments with good fitting. Lack of the information about body shape would be the major cause of fitting problems. This study investigated Taiwanese college females' body types and figure variations based on their perceptions. A questionnaire with five categories of figure-type illustrations was administered to participants for them to select figure shapes that represent their bodies. Results show that the commonly occurring figure variations were hourglass, sloped shoulders, flat back, and forward stance within categories of Shoulder/Hip Relationship, Shoulder Type, Back Type, and Stance. Information related to body shape allows software designers of CAD systems to understand the effects of figure variations on pattern making, so the apparel industry would finally create customized garments that will achieve good fitting.

Keywords：body shape, pattern alteration

1. Introduction

The customized process applied by the US apparel industry is aided with apparel technologies to extract body measurements from 3-D body scanners, and the measurement data are entered into CAD systems. The CAD software converts existing patterns to individualized patterns, so apparel products are able to meet personal fitting requirements (Istook, 2002). However, customers are not always satisfied with the products that are customized. Apparel companies, such as Levi-Strauss, have tested the customization service, but have not yet successfully turned a profit. The high rate of customer returns could be a result of fitting problems (Lee, Kune, Fiore & Campell, 2002). The most difficult factor in achieving personal fit is accurate information about body

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shapes, according to Farmer & Gotwals (1982). Without sufficient and accurate information about body types and figure variations, existing patterns would be not altered properly to individualized patterns. Therefore, the improvement on fit of customized garments can be accessed by acquiring more information about figure types and variations. However, body measurements and body shapes are changed depending on age; uncertainty about what kind of body types or figure variations a certain aged group has would not help the apparel industry make good-fitting garments for their target markets. While some US companies have promoted the apparel Technologies in Taiwan, the purpose of this study is to investigate Taiwanese college females' body types and figure variations. Based on their perceptions, results of commonly occurring body types and figure variations are found; findings also show that some figure variations come in combination with one another.

2. Literature Review

Generally, human bodies vary from an ideal or from one another due to physical differences of height, bone size or frame, proportion, contour, and posture. These characteristics interrelate with each other, so females usually have more than one figure variations (Rasband, 1995). In spite of the factors that human bodies vary and figure variations come more than one, Sheldon and his colleagues excluded subjects with figure variations in the study of body types. Human subjects who had irregular development of bones and muscles and imbalance deposits of fat in bodies were not considered in their study. By applying a somatotyping technique, college male students were classified into 76 body types which were finally categorized as ectomorphs, mesomorphs, and endomorphs (Chowdhary, 1993; Jones & Rioux, 1997; Salusso-Deonier, Markee & Pedersen, 1991). Unlike the classification developed by Sheldon and his associates, Salusso-Deonier et al. (1991) recruited subjects with figure variations. She collected photographic data of women aged between 18 and 40 years. Five categories of woman figures were determined based on degree of pelvic tilt, development of bones and muscles, deposits of fat, frame size, and relationship between shoulders and hips. The five categories were "small to large frame with balanced bone, muscle, and fat," "small to large frame with greater muscle development than typical woman," "small to large frame with greater fat development than typical woman," "small to medium frame with wider shoulders and narrower hips than typical woman," and "medium to large frame with narrow shoulders and wider hips than typical woman" (Salusso-Deonier et al., 1991). Salusso-Deonier et al. also used the somatotyping technique to analyze body types, but Devarajan and Istook (2004) applied body scanners and Female Figure Identification Technique (FFIT) software to predict females' body types. Devarajan and Istook (2004) collected data of body measurements and calculated the ratios of busts to waists, hips to waists, and hips and busts. These ratios were criteria to sort the female subjects' body types into hourglass, bottom hourglass, top hourglass, spoon, rectangle, diamond, oval, triangle, and inverted triangle.

Although Devarajan and Istook (2004) and Salusso-Deonier et al. (1991) classify body types by evaluating relationships among the bust, waist, and hip, Salusso-Deonier et al. points out degree of pelvic tilt, a way of stance or posture, is a crucial element in classifying body types. In addition, Douty (1963) demonstrated that the back shape, shoulder shape, and buttocks shape along with body type, posture, and body build were important factors to decide whether garments were fitted female bodies. Body types and shapes were absolutely key points for pattern making and clothing construction (Connell, Ulrich, Knox, Hutton, Woronka & Ashdown, 2003). The body shapes affecting apparel fit have to be evaluated in order to alternate existing patterns properly.

3. Method

3.1 Instrument

The questionnaire used to examine body types and figure variations contained five categories, abdomen/thigh relationship, shoulder/hip relationship, shoulder type, back type, and stance. The figure drawings illustrated on this questionnaire were retrieved from the book written by Armstrong (1987). Knowing that most body-type classifications were decided by evaluating relationships among the bust, waist, and hip, five different shoulder/hip relationships were included under the category of shoulder/hip relationship (Figure 1, 2, 3, 4, 5). Also, degree of pelvic tilt or stance, the back shape, shoulder shape, and buttocks shape which affected garment fit were taken into account. The figure illustrations were placed by line drawings; various figures were specified by terms underneath.

3.2 Subjects

Subjects were 110 college females who enrolled in the Department of Fashion Design and Merchandising, Shih-Chien University in Taiwan; they were aged between twenty-one and twenty-five and volunteered for this study. These subjects had taken a series of Clothing Construction courses at least two academic years, totally four semesters. Aiming at training students with fitting knowledge, the series of basic and advanced courses had required students making muslin garments with standard sizes and wearing them to test fit. Alternation on these muslins had allowed them to realize what kind of irregular or asymmetric figures they had. With the academic training, these subjects would objectively judge their body types and figure variations.

3.3 Procedure

During the survey, these subjects were asked to select the figure illustrations mostly represented their body types and figure variations. After the figures were chosen by the respondents; descriptive statistics were used to analyze.

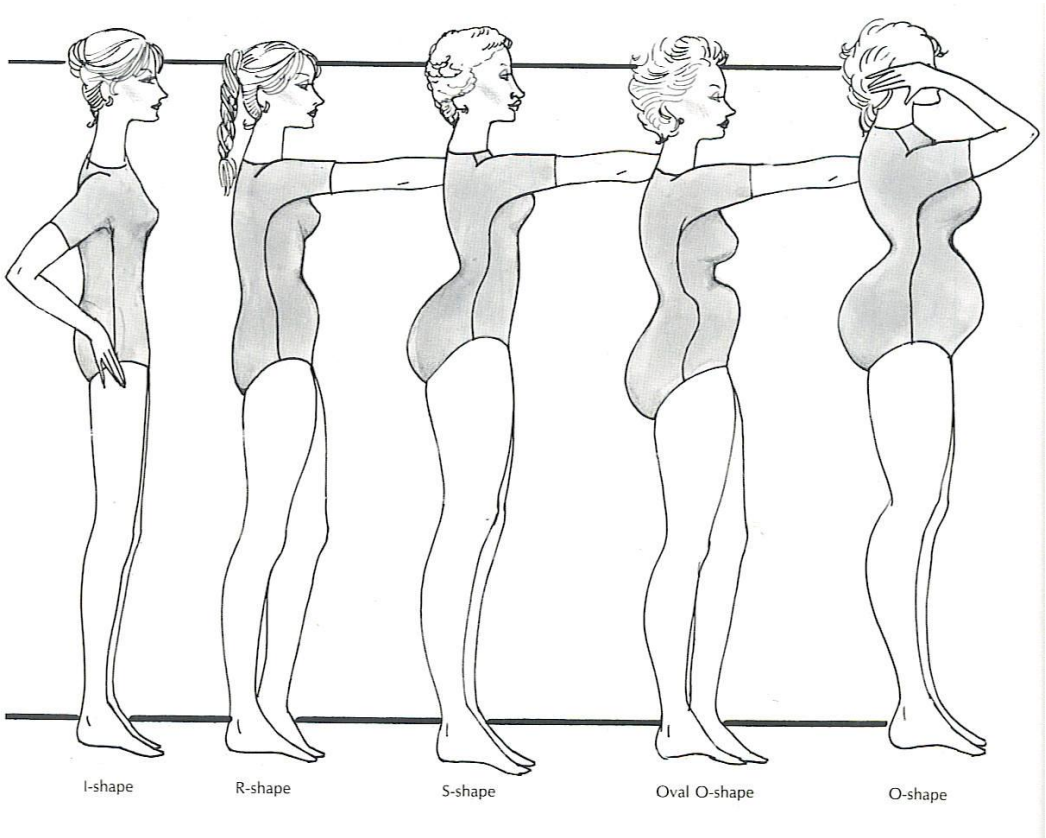

Fig 1 Abdomen/thigh relationships

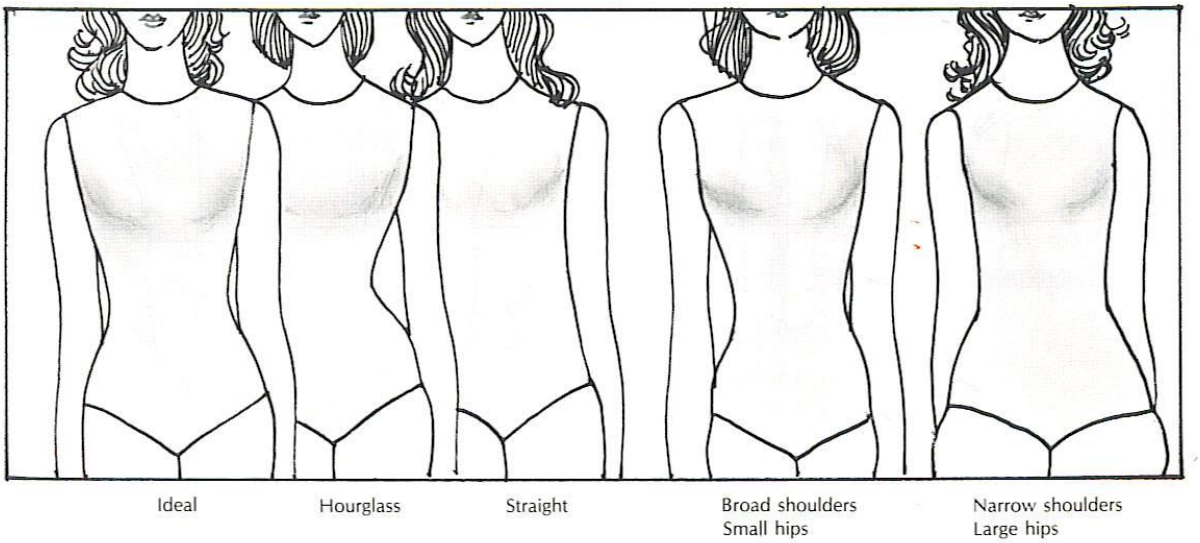

Fig 2 Shoulder/hip relationships

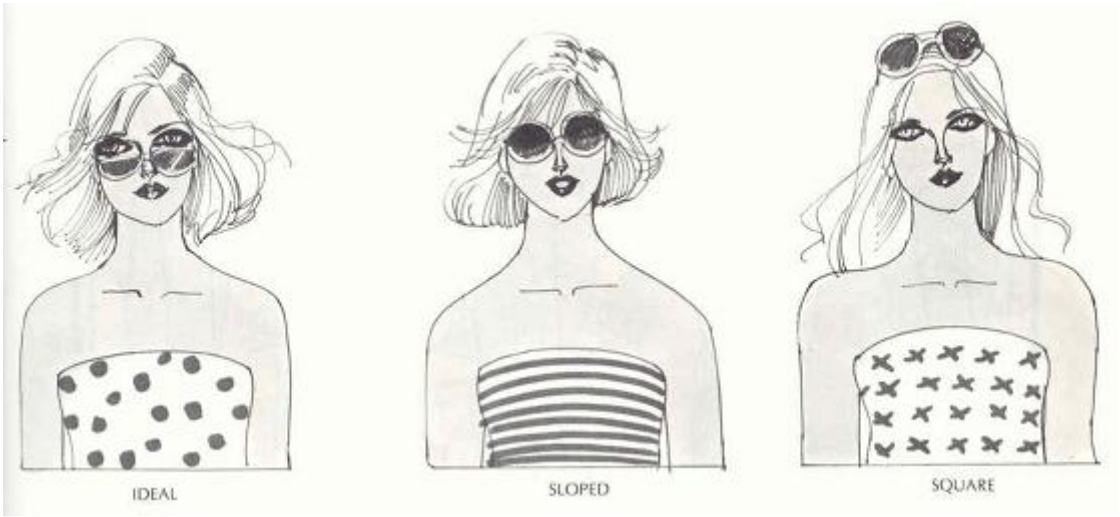

Fig 3 Shoulder type

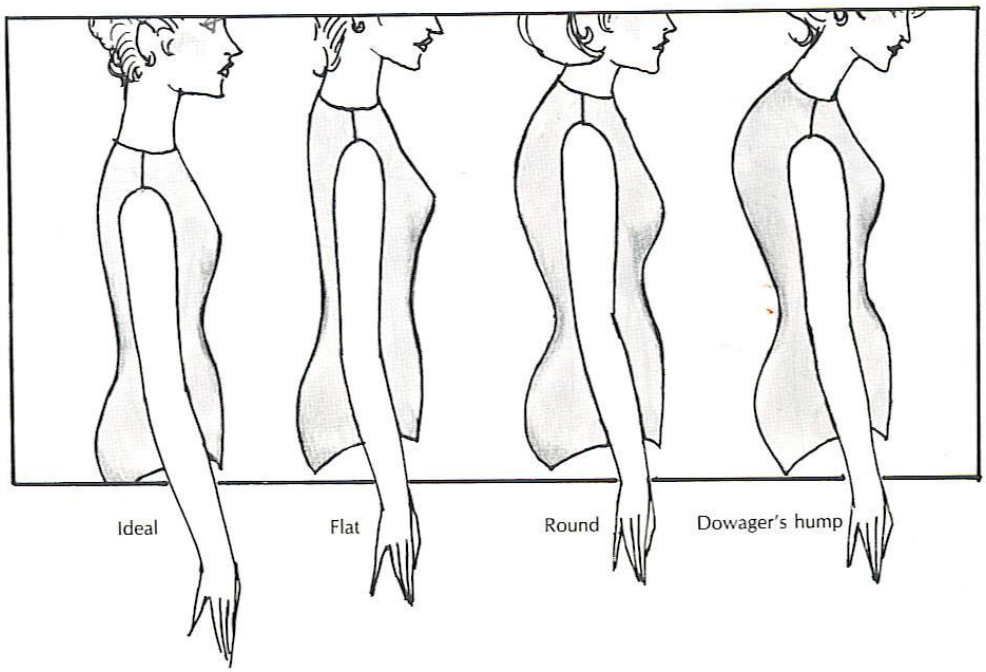

Fig 4 Back type

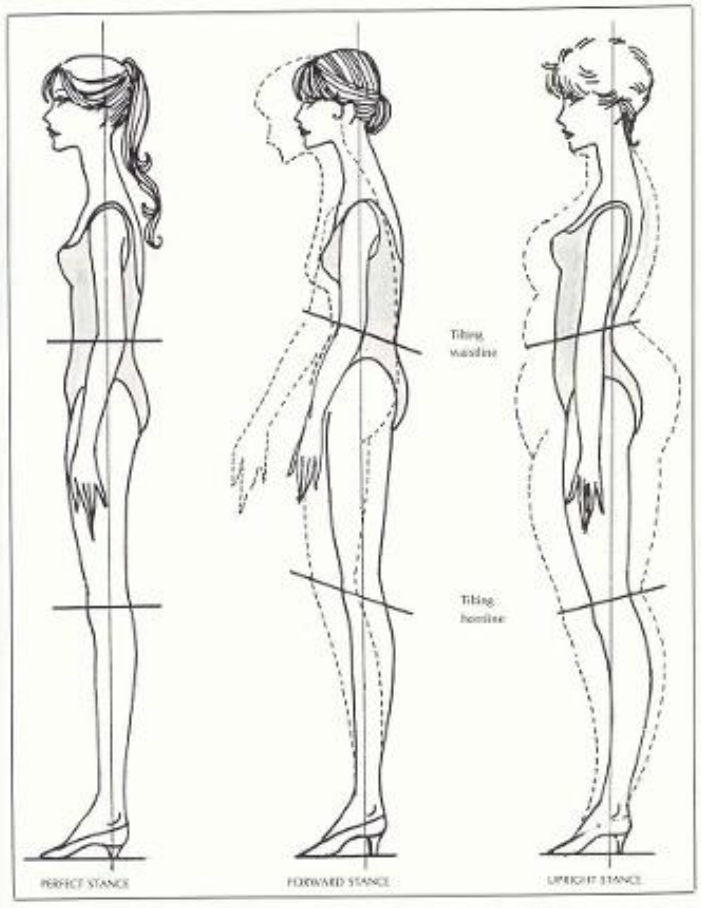

Fig 5 Stance

4. Results

The majority of respondents tended to select "ideal" in representing their figure types. Without the option of "ideal" under the category of abdomen/thigh relationship, 38.5% (n= 42) of the respondents perceived their proportions of the abdomen and thigh as I-shape; 32.1% (n= 35) and 21.1% (n= 23) were R-shape and S-shape respectively (Table 1). 49.1% (n=53) of the subjects reported their shoulder/hip relationships were the ideal; 17.6% (n= 19) of them felt that they were hourglass while 13.9% (n= 15) of them perceived the proportion as straight. For the category of shoulder type, 73.8% (n= 79) of the female students identified their shoulder types as ideal and 15.9% (n= 17) of them perceived that they had sloped shoulders. 60.6% (n= 66) of the subjects indicted that their back types were ideal, and 21.1% (n=33) of them determined that their back types were flat. Among these respondents, 54.5% (n= 60) and 32.7% (n= 36) of them perceived their stances as perfect stances and forward stance respectively.

5. Discussion

Taiwan is a small country with population about 21.5 million living in around 36,000 square kilometers. Its population consists of almost 98 percent of Han people originated from China and less than 2 percent of aboriginal people (Kuo, 2004). Although the ethnic backgrounds of Taiwanese and American are far from identical, the occurrence of hourglass as the most common body shape in this pilot study is consistent to some previous studies. The study conducted by Jackowski (2001) classified body types based on the ratios among the bust, waist, and hip without the including of an ideal or a standard body type. Jackowski (2001) addressed that most American women were either hourglass or spoon. Moreover, Anderson, Brannon, Ulrich, Presley, Woronka, Grasso & Stevenson (2001) investigated young women's fitting preference and found that more than half of the college females and black professional females selected the hourglass to represent their body types. Although "hourglass" is found as the most commonly observed shape in these studies, rectangle or straight emerges as the major type on the research of Devarajan and Istook (2004). Devarajan and Istook (2004) concluded that the occurrence of rectangle in their study was because the convenience samples were not chosen appropriately; they should have recruited subjects with various body types. While most of Taiwanese college females perceive they have the ideal body types, some perceive their body types as either hourglass (17.6%) or straight (13.9%). Indeed, the hourglass could be the most common type existing among Taiwanese college females if the option of "ideal" is eliminated.

Despite the evidence of hourglass perceived as the dominant shape among young Taiwanese and US females, differences such as posture and fat deposits are still existing. Salusso-Deonier et al. (1991) demonstrated that irregular proportions of shoulders and hips came with the moderate-to-full pelvic tilt. Particularly, fat deposits were more developed on the lower body rather than the upper body for the irregular proportion of narrow shoulders and wider

hips, and this asymmetric proportion is in combination of small breast. On the other hand, this study finds that the pelvic tilt or stance among the college females is perfect (54.1%) no matter what kind of shoulder and hip relationships they have. Furthermore, the college females tend to have slight curvature on the lower back and little fat deposits on the abdomen, buttocks, or thigh regardless of the shoulder/hip relationship and the pelvic tilt. In fact, the result of no association between Abdomen/thigh relationship and the pelvic tilt in this study does not conform to the study of Salusso-Deonier et al. (1991). She stated that little curvature on the lower back and flat buttocks are caused by slight pelvic tilt. Moderate pelvic tilt creates medium curvature on the lower back and produces the rounded buttocks. Full pelvic tilt brings deep curvature and very rounded buttocks. According to Salusso-Deonier (1989), the degree of pelvic tilt were grouped into slight, moderate, and full tilt, and the moderate and full pelvic tilts were more common than the slight tilt. That the moderate and full pelvic tilts were more common than the slight tilt is the opposite of this study's conclusion. The finding shown in this study is that the majority of Taiwanese college females have ideal to slight pelvic tilt with little curvature in the lower back as well as flat buttocks.

To sum up, most Taiwanese college females have the ideal body type, shoulder type, back shape, posture, slight curvature on the lower back, and small buttocks, abdomen and thigh. Small portion of them have figure variations such as hourglass body type, flat back, sloped shoulder, and forward stance. Particularly, the consequence of numerous Taiwanese young females, who have sloped shoulders in combination with forward stance, is expected. However, for those who have ideal to flat back in combination forward stance, the outcome is unusual, because the forward stance always occurs with round backs. Thus, the possibility of this occurrence could be the forward stance with tilt of heads instead of with the upper-body tilt. The further research may evaluate angles of back shape or degree of body tilt to analyze this figure variation.

Because human bodies are very complicate, apparel fit has been a challenge for manufacturers and retailers in the industry. As made-to-measure process is getting popular, fitting problems resulted from lack of the information about body types and figure variations have to be overcome. If software designers of CAD systems understand body shapes and realize the effects of figure variations on pattern making, they would finally design software which can automatically select properly existing patterns and alter them into individualized patterns; customized garments will achieve good fitting. This present study uses a questionnaire to examine female figure variations. The questionnaire has to be modified more specifically since this stimulus is the first to be administrated. Indeed, the category of stance contains only three different postures. Some college females who perceive their postures as perfect stance might have slightly upright posture, so the figure stances can be precisely identified the pelvic tilt to be forward perfect, erect, and very upright posture.

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Table 1　Frequencies and percentages of Body-type Perception

	Frequency	Percentage %
Abdomen/thigh relationship		
I-shape	42	38.5
R-shape	35	32.1
S-shape	23	21.1
Oval O-shape	8	7.3
O-shape	1	0.9
Shoulder/hip relationship		
Ideal	53	49.1
Hourglass	19	17.6
Straight	15	13.9
Broad shoulder/small hip	8	7.4
Narrow shoulder/large hip	13	12.0
Shoulder type		
Ideal	79	73.8
Sloped	17	15.9
Square	11	10.3
Back type		
Ideal	66	60.6
Flat	23	21.1
Round	14	12.8
Dowager’s hump	6	5.5
Stance		
Perfect stance	60	54.5
Forward stance	36	33.0
Upright stance	14	12.8