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Pattern Design and Fitness of Business Jacket

Xin Zhang*, Fangfang Cui, Yongmei Deng, Yanbo Ji, Quan Sun

Apparel & Art Design College, Xi'an Polytechnic University, Xi'an 710048, China

Abstract

Modern design of business wear should not only meet the functional requirements, but also meet the fitness and aesthetics requirements. Research done in clothing companies show that unfitness has currently become an obstacle to the development of business wear enterprise. This paper points out the problem and the design needs of an enterprise business jacket. From pattern to design method and ease design as two aspects for further research, it is proposed that based on human characteristics of the business jacket pattern to the design ideas, and through the samples wearing effects, evaluation should be carried out to determine the exact ease and relevant parts that are free of business jacket. This study aims to put forward business jacket pattern designs to provide a new method and for such wear design and distribution of ease to provide a reference basis, which acts as full of theoretical and practical values.

Keywords: Business Wears; Fitness; Pattern Design; Ease Design

1 Introduction

Business wear is the clothing which is designed by the ergonomic and body protection, and emphasizes on protective, safe and healthy work [1]. Through the survey of enterprise, it is put forward that: due to the cost and technical issues, most domestic business wear enterprises do not make cloth to one's own measurements, and instead uses the characteristic dimensions to target groups, leading to the pattern size not consistent with the request, henceforth affecting the accuracy of the pattern of design. In addition, the enterprise is used in pattern to design method defects, regardless of the business wear of aesthetic artistry, and cannot adapt as a business wear pluralistic development. Without the correct understanding, the enterprise of ease design would result, in the design principles of selecting "big" to cause the wear effect to be not beautiful, unfit and as a result, a fabric waste. Therefore, in order to achieve higher fitness of business wear, there still needs to be improvement of the techniques and methods.

In view of the above questions, subject to the use of extensive jacket business wear and the influence of the main factors of the compound, this paper mainly studies business wear pattern to design method and ease design. This study aims to provide technique and method for pattern design and fitness evaluation of business wear, and the fundamental solution to the unfitness of business wear.

*Corresponding author.
Email address: xianzhangxin@sina.com (Xin Zhang).

2 The Pattern Design Based on Human Characteristics

2.1 The Pattern Design Method

It is commonly understood that a key problem of pattern design in business wear enterprises is the mismatch between the design of cloth pattern sizes and the characteristic dimensions of the wearer, causing unfitness of business wear. Currently most business wear enterprises still adopt the plane design method, as the pattern to the original method cannot adapt to the fashionable and aesthetics requirement of modern business wear. In regards to the characteristics of business wear, every type of business wear on design changes to follow certain rules. Whilst it can often in certain "base prototypes" transform, the design work does not need repeatability.

Based on various clothing pattern design methods [2, 3], it is proposed based on the human characteristics of pattern to design method.

This method is mainly uses plane and draping combination of methods. It consists of three steps to use the draping and plane cutting method to design the pattern. First, basic pattern with human characteristic dimensions was obtained by the draping cutting method, and then promoted to the sub-basic pattern which includes segmentation lines, darts and ease complying with the characteristics and requirements of garment style. Finally, the sample pattern can be transformed to the sub-basic pattern by the consideration of the style specifics (such as the collar, sleeve, hem and pocket). Concrete ideas are shown below:

Basic pattern (included human characteristics) →Sub-basic pattern (included segmentation lines, darts and ease) - Sample pattern (transforming: collar, sleeve, hem and pocket, etc.). An example is shown in Fig. 1.

2.2 Design Process

Specific process of pattern design is shown in Fig. 2.

3 Ease Design Experiments

3.1 Samples Preparation

According to the pattern design ideas and steps in Section 2, and to draw the jacket-business

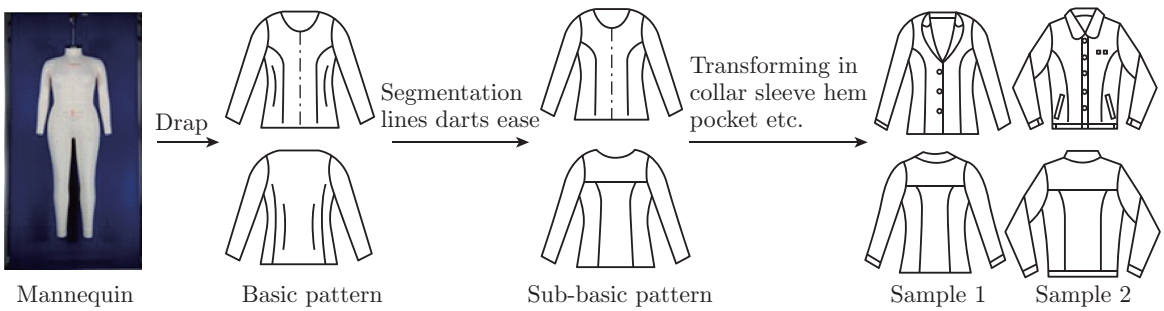

Fig. 1: The pattern design method sample

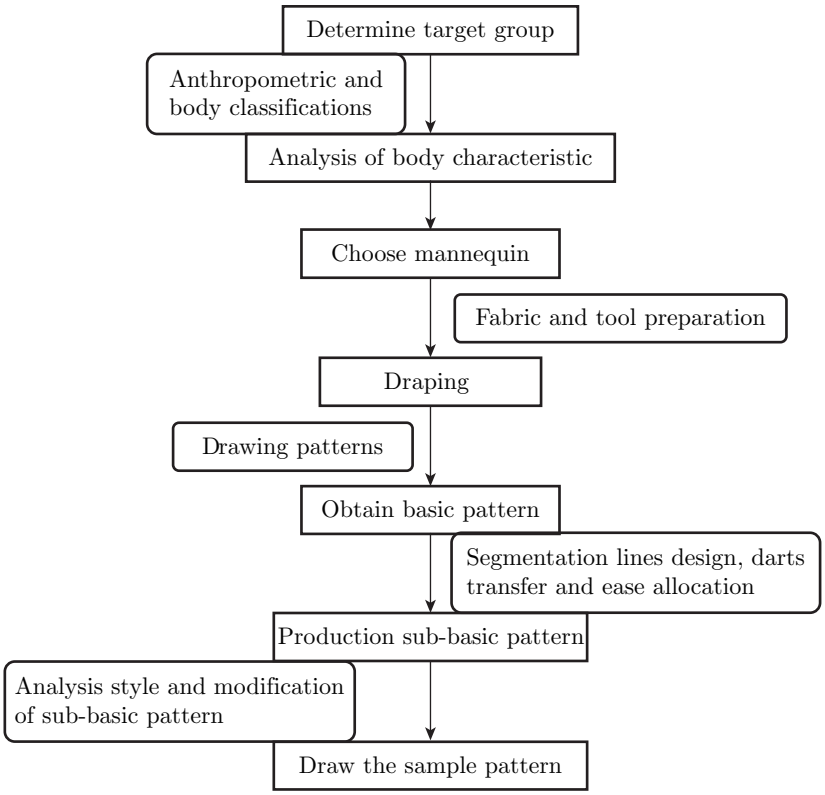

Fig. 2: Pattern design flow chart

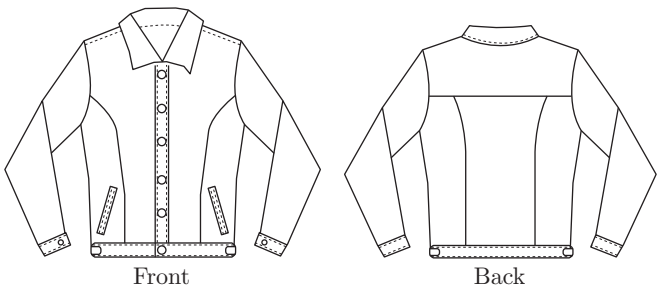

Fig. 3: The style of business jacket

wear pattern as shown in Fig. 3, requires the ease design in three aspects:

(1) From past experience, the clothing basic ease should not be less than 10 cm. The minimum circumference of the experiment mannequin is 102 cm by draping, and then

$$\text{Basic ease} = \text{minimum circumference - bust} = 102 - 92(\text{cm}) = 10(\text{cm}) \tag{1}$$

Therefore, the minimum ease is 10 cm for this body type.

(2) For different types of work, human activities range is different. Its business wear ease is different as well. For some works, workers' activity level is the minimum, such as workers who are the supermarket promoters, sewing etc., its business wear ease is not needed to be too big. This article mainly aims at the demand of these kinds of professional workers to design the business wear pattern. This type of cloth belongs to the casual wearer with the range of ease as 15 cm $\sim$ 20 cm.

(3) In enterprise, pattern designer thinks that functionality is the most important business wear, so the ease of wear is better when bigger the. But they ignore the aesthetic of business wear, so the ease of wear is too large, such as when the ease of lady jacket business wear becomes about 22 cm.

Through the above analysis, this experiment design uses three samples with ease of 12 cm, 16 cm, 20 cm respectively, and makes them with the same fabric, namely sample 1, sample 2 and sample 3, as shown in Fig. 4.

Sample 1 Sample 2 Sample 3

Fig. 4: The experimental garment samples

3.2 Experiment

3.2.1 Subjective Evaluation Experiment

The subjective evaluation experiment is divided into two aspects. On the one hand, different wearers evaluate one sample according to their wearing feelings, mainly from the comfortableness of clothing to consider the fitness. On the other hand, several professional valuators evaluate the result of one wearer's wearing condition, aiming to research the fitness from the aesthetics. Therefore, there needs to be different evaluation indices and psychological scales to carry out the two experiments.

The subjective evaluation from the wearers complies with Likert 5 Grade Scales [4] to study the ease and fitness of clothing. The standards are as follows: the negative value means clothing is too tight, positive value means it is too loose, and 0 means its fitness is good. So, when the result is close to 0, the fitness effect is better, as shown in Fig. 5.

The evaluation results of the valuator groups comes from their questionnaires which include clothing style (as the appearance outline, coordination and balance, fitness, drapability, etc.), the smooth key parts such as shoulders, bust, back, collar, cuff and so on, as well as whether the clothing helps to beautify the wearer or not. The evaluation grades are shown in Fig. 6, with the environment of the test the same as the above.

The research is about the fitness evaluation of jacket-business wear. It not only contains the functionality of clothing, but also expresses the aesthetic of clothing. So, on the basis of accessing

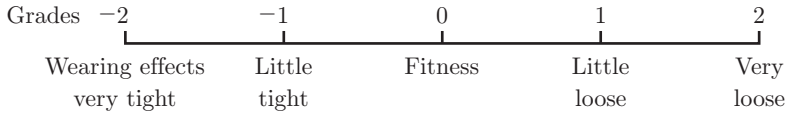

Fig. 5: The scale of wearer subjective evaluation

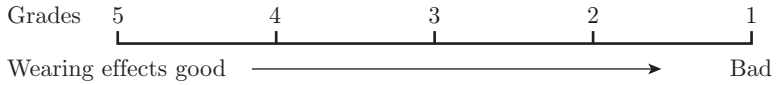

Fig. 6: The scale of valuators subjective evaluation

to a large number of relevant literature and concluding the evaluation of garment fit, and after discussing with students and businesses who are relevant to the subject of clothing and then combining with the characteristics of frock, all the above determines that that the evaluation indicators of the research are mainly clothe A, collar B, shoulder C, bust D, back E, armhole F, armpit G, waist H, hems I, etc, to consider whether the clothing is tight or loose.

Besides, there are many different behavior actions among different jobs. The regular movements of workers include lifting the arms, bending waists or knees and so on. Therefore, in this study, we require that after doing the daily actions (such as natural standing, bust, arms akimbo, arm lateral raise, arm held flat and 90-degree bend with arms drooping naturally, etc), the workers should then fill in the questionnaires according to the true feelings of wearing.

(1) Evaluating experiments of wearers

In this experiment, we require the wearers with the characteristics as follows: bust −92 cm, waist −72.5 cm, hip −98 cm, as well as shoulder width −39.5 cm, and selected six students meeting the requirements as the subjects. The body dimensions of the wearers are shown in Table 1.

Before the fitting experiment, we explained the questions of the questionnaire to the wearers, ensured the purpose of evaluation to them, the meanings of every evaluation indices and made sure the description of their feelings was well understood. The wearers tried on the clothing in accordance with the order No. 1, No. 2, No. 3, and then answered the questionnaires after feeling all the effects of the clothing.

(2) Evaluation experiments of group

The group evaluation included 20 persons: graduate students that major in cloth, quality inspectors and pattern makers. The No. 2 wearer in Table 3 is closer to the standards of the experiment mannequin. In the process of completing evaluation questionnaires, evaluators asked the wearers' subjective feelings, and required the wearers to do the specified actions, with the wearing effect shown in Fig. 7.

Table 1: The basic body dimensions of wearers

No.	Age	Height (cm)	Weight (kg)	Bust (cm)	Waist (cm)	Hip (cm)	Shoulder width (cm)
1	24	168	56	89	73	98	39
2	25	165	54	92	74	98	38
3	24	165	52	89	74	96	38
4	24	167	55	90	74	97	39
5	24	168	56	93	75	98	38
6	25	167	54	89	74	98	38

3.2.2 Objective Evaluation Experience

This experiment uses the wearing effect camera system of the Shanxi clothing engineering center to film eight different angles of samples, and then obtain the perspective pictures by processing, as shown in Fig. 8. Considering that the mannequin arm cannot be arbitrarily raised for the clothing to fold, the freedom will affect the real parts' ease, so, the freedom of samples' key parts were placed under two conditions and then measured (as shown in Fig. 9). Sleeves were 45°, the

Fig. 7: The wearing effect of garment samples with different eases

Fig. 8: The perspective pictures of garment wearing effect

Fig. 9: The garment appearance during wear

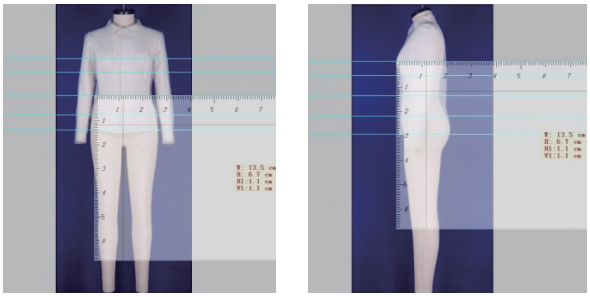

Fig. 10: The schemes of garment freedom

clothing was relatively flat, and the freedom was accurate.

Objective evaluation indicators include bust freedom, under bust freedom, waist freedom, and hip freedom, as shown in Fig. 10.

3.3 The Experimental Results and Analysis

3.3.1 The Experimental Results and Analysis of Subjective Evaluation

The mode of evaluation results for samples with different eases were summarized (shown in the Table 2 and Table 3). From the evaluation results, we can see the ease has significant inferences to the wearing effect of the samples' back, bust and shoulder. The fitness and stiffness of samples has obvious changes because of the different eases, but for the collar and cuffs and bottom parts there was little influence.

From the line charts, it can be seen that the concentration trend of evaluation result are more intuitive, as shown in Figures 11 and 12.

From the line charts, we can see that the 1st sample garments' back was obviously too tight, the wearing effect was tight, and the wearing effect evaluation index scores was volatile. For the 3rd sample, the wearing effect was too loose, evaluation index scores were much lower and the evaluating index scores was near zero of the 2nd sample which indicated that jacket business wear with 16 cm ease had the best wearing effect. Therefore, the evaluation results shows that the jacket business wear with 16 cm ease is more fit based on comfort and aesthetics.

Table 2: The mode of subjective evaluation with tries

Items	A	B	C	D	E	F	G	H	I
1#	−1	0	−1	0	−2	0	0	0	0
2#	0	0	0	0	−1	0	0	0	0
3#	1	0	1	1	1	0	0	1	0

Note: A means the whole fitness effect, B means the fitness effect of collar, C means the fitness effect of shoulder, D means the fitness effect of bust, E means the fitness effect of back, F means the fitness effect of armhole, G means the fitness effect of armpit, H means the fitness effect of waist, I means the fitness effect of bottom; 1#, 2 # and 3# means samples' numbers separately.

Table 3: The mode of subjective evaluation with evaluators

Items	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17
1#	4	4	3	3	3	2	4	3	4	4	4	4	4	4	4	4	5
2#	4	4	3	4	3	3	3	3	4	4	3	4	4	3	4	4	4
3#	3	3	2	2	3	2	3	3	2	3	2	3	4	4	4	3	4

Note: X1 means whole appearance outline, X2 means whole balanced sense, X3 means whole fitted feeling, X4 means whole stiff and smooth, X5 means draping, X6 means smooth for shoulder, X7 means flatness for bust, X8 means flatness for armpit, X9 means flatness for bust, X10 means flatness for back, X11 means stiff and smooth for waist, X12 means stiff and smooth for back, balance, X13, X14means balanced sense and fitness for collar, X15, X16 means smooth and flatness for cuffs, X17 means smooth for hem.

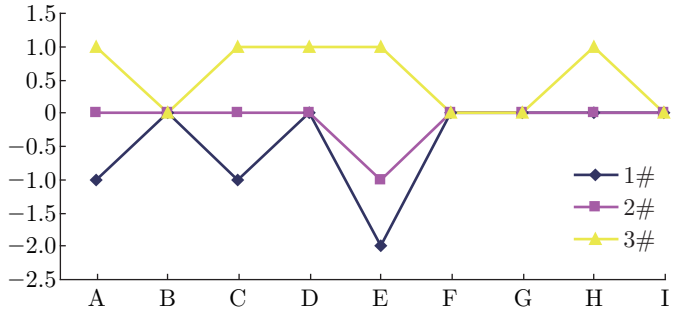

Fig. 11: The mode line chart of wearer's evaluation result

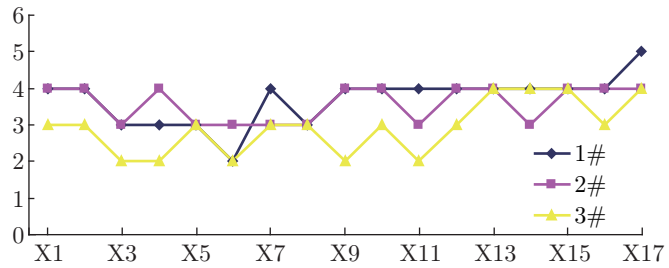

Fig. 12: The mode line chart of evaluators' evaluation result

3.3.2 The Experimental Results and Analysis of Objective Evaluation

According to the experiment method, the key parts' freedom of three samples were tested, the key parts' mean freedom of samples with front and side in clothing, sleeves natural prolapsed (state one) and 45° (state two) are all shown in Tables 4 and 5 respectively.

The best wearing effect and fitness of the sample was 16 cm ease from the subjective evaluation results. All parts' freedom of the sample with 16 cm ease in state one and state two is shown in Table 6. The freedom of sample in state two is the reference range for movement ease.

Table 4: The mean freedom of samples in state one Unit: cm

Items	1#	2#	3#
BF1	1.08	1.08	1.08
BF2	1.29	1.40	1.61
UBF1	1.08	1.61	2.15
UBF2	2.15	2.69	3.01
UBF3	4.30	4.30	4.30
WF1	1.18	2.15	3.44
WF2	1.08	1.08	1.61
WF3	4.30	4.30	4.30
MHF1	0.54	1.08	1.08
MHF2	0.54	1.08	1.29
MHF3	1.08	1.08	1.08
HF	1.08	2.15	2.15
SF	0.54	1.08	1.61

Table 5: The mean freedom of samples in state two Unit: cm

Items	1#	2#	3#
BF1	3.23	4.30	6.45
BF2	1.18	1.94	2.15
UBF1	1.61	2.69	5.38
UBF2	2.15	2.26	2.30
UBF3	3.23	3.23	3.23
WF1	2.15	3.23	4.30
WF2	1.08	1.29	1.94
WF3	3.55	3.87	4.09
MHF1	1.08	1.08	1.08
MHF2	0.86	1.08	1.08
MHF3	1.08	1.08	1.18
HF	1.08	2.15	2.15

Note: In Table 4 and Table 5, BF1 means bust freedom in said, BF2 means bust freedom in front, UBF1 means under bust freedom in side, UBF2 means under bust freedom in front, UBF3 means under bust freedom in back, WF1 means waist freedom in side, WF2 means waist freedom in front, WF3 means waist freedom in back, MHF1 means belly freedom in said, MHF2 means belly freedom in front, MHF3 means belly freedom in back, HF means hip freedom in front, SF means muscle freedom.

Table 6: The mean freedoms of samples with 16 cm ease Unit: cm

Items	BF1	BF2	UBF1	UBF2	UBF3	WF1	WF2
State one	1.08	1.40	1.61	2.69	4.30	2.15	1.08
State two	4.30	1.94	2.69	2.26	3.23	3.23	1.29
Item	WF3	MHF1	MHF2	MHF3	HF	SF	
State one	4.30	1.08	1.08	1.08	2.15	1.08	
State two	3.87	1.08	1.08	1.08	2.15		

4 Conclusion

This paper was for the unfitness of business wear in enterprise, and proposed the pattern design methods based on human characteristics combination with the theoretical analysis and practical research. It uses the method designs of three jacket-business wear with different eases of 12 cm, 16 cm and 20 cm. Through the subjective evaluation experiment on three samples wearing effects, the conclusion is that the jacket-business wear with 16 cm is the fit. And using the camera system to film wearing effect of samples from eight angles, all parts of the freedom can be observed clearly from perspective views of wearing effects, whilst the freedom of sample was summarized with the best wearing effect under two kinds of condition which included clothing, sleeves natural prolapsed and 45° (as shown in Table 6). This study aims to provide technique and method for pattern design and fitness evaluation of business wear.

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